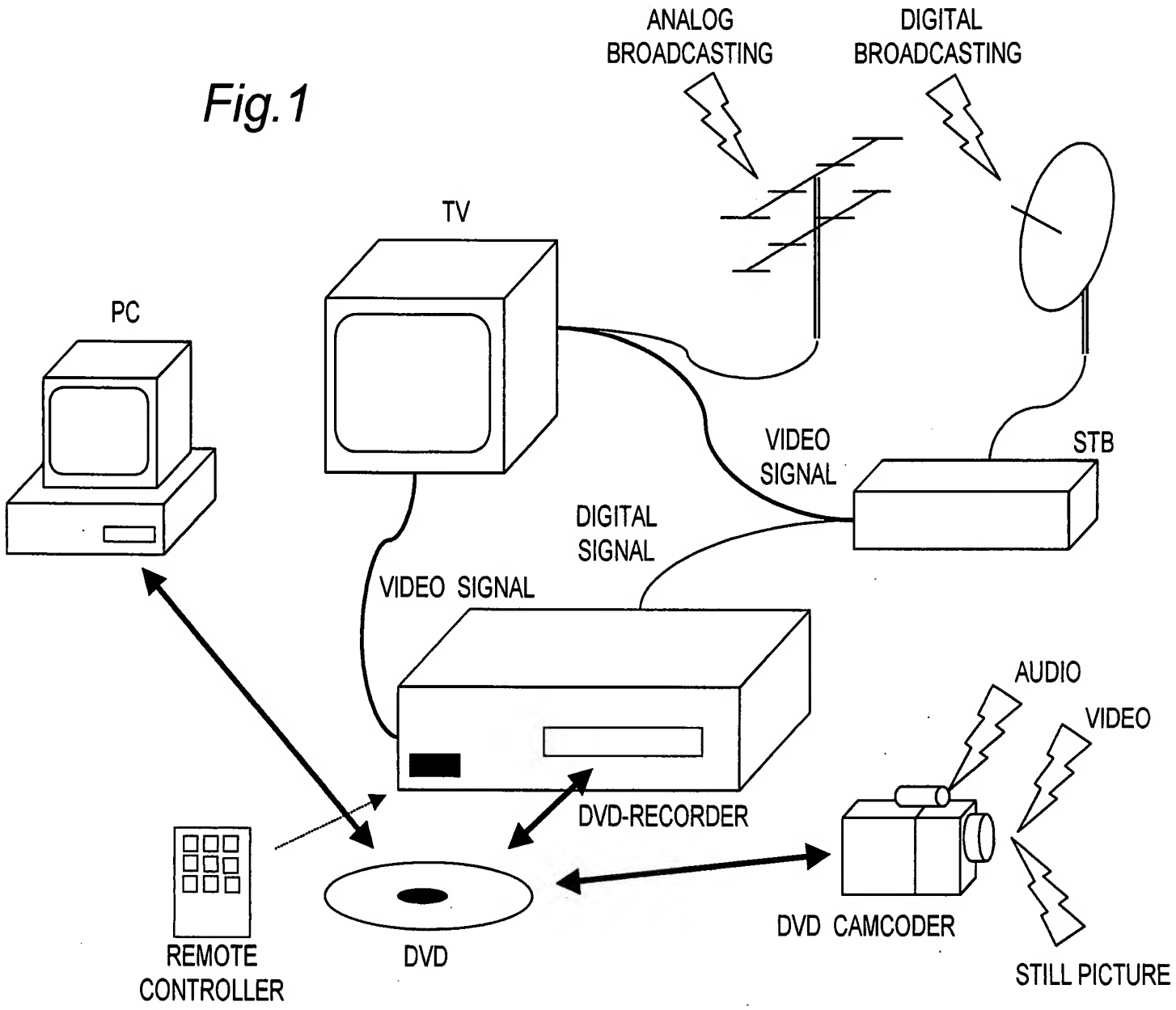
Fig.1



10/552372

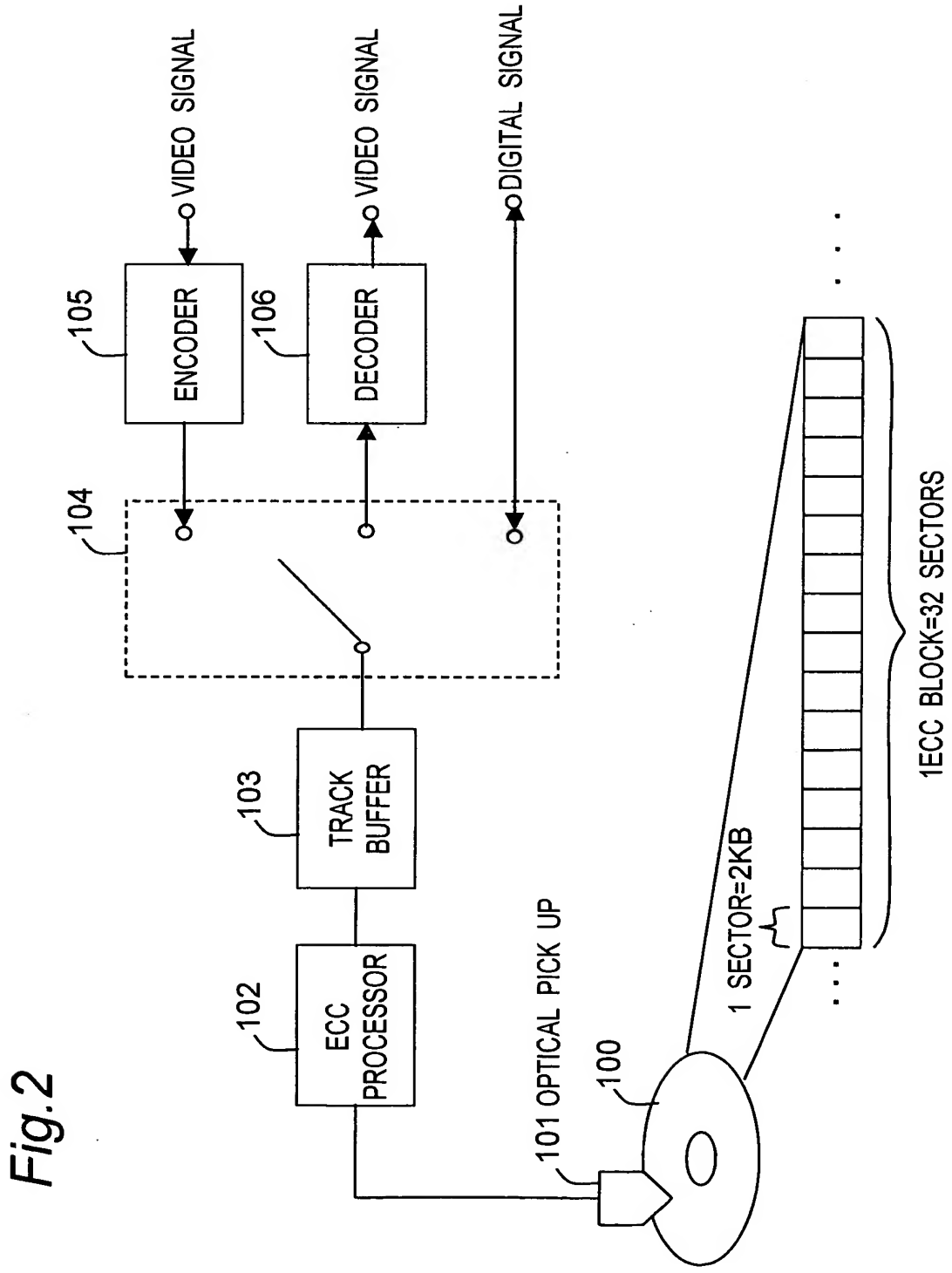

VIDEO SIGNAL
VIDEO SIGNAL
DIGITAL SIGNAL
105
ENCODER
106
DECODER
104
103
TRACK BUFFER
102
ECC PROCESSOR
101 OPTICAL PICK UP
100
1 SECTOR=2KB
1ECC BLOCK=32 SECTORS

Fig.2

Fig.3A

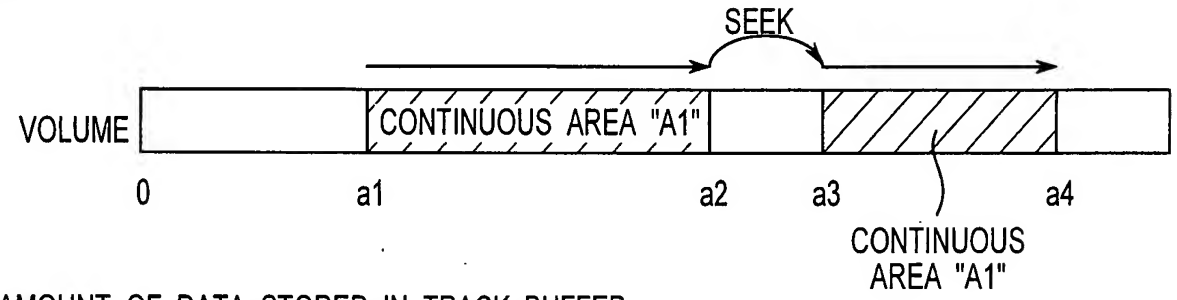
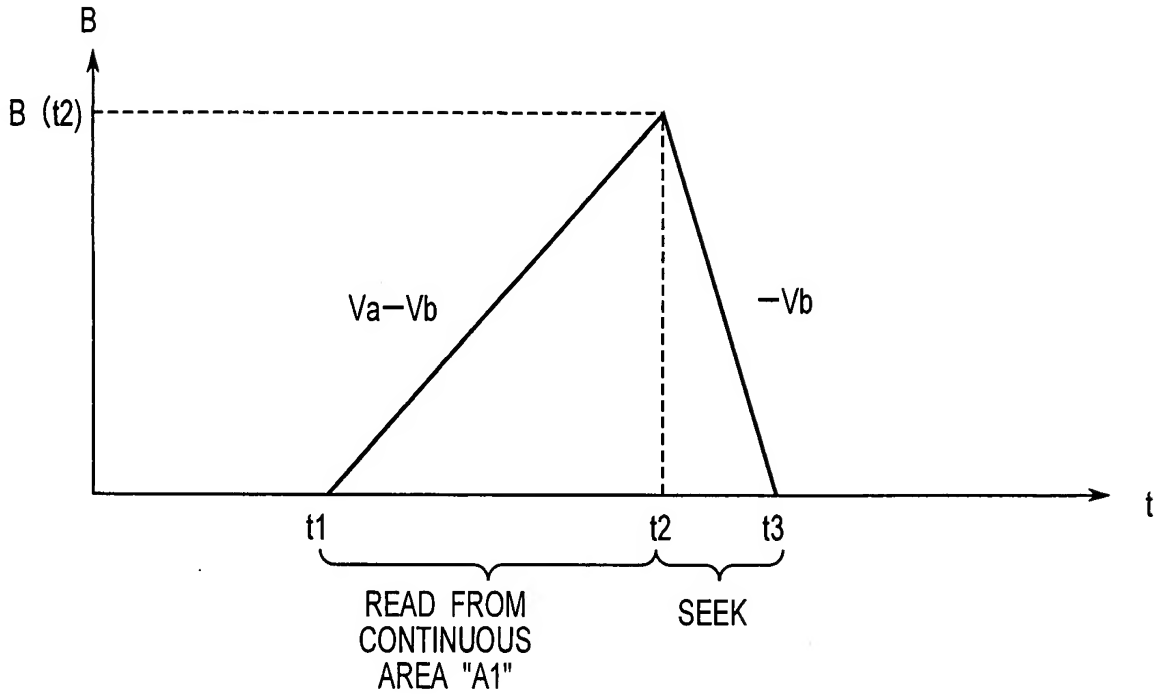


Fig.3B



10/552372

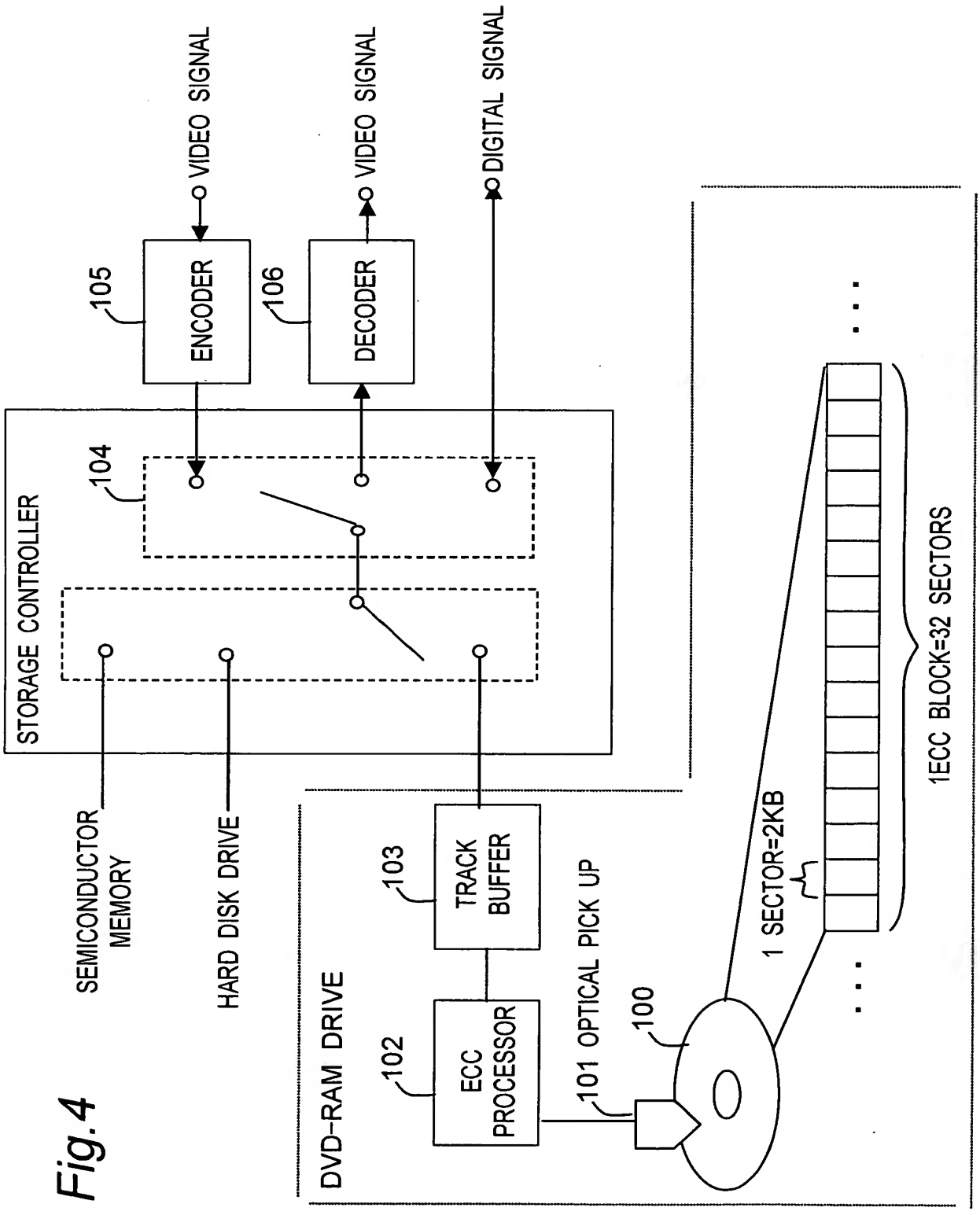

VIDEO SIGNAL
VIDEO SIGNAL
DIGITAL SIGNAL
105
ENCODER
106
DECODER
104
STORAGE CONTROLLER
SEMICONDUCTOR MEMORY
HARD DISK DRIVE
103
TRACK BUFFER
102
ECC PROCESSOR
101 OPTICAL PICK UP
100
DVD-RAM DRIVE
1 SECTOR=2KB
1ECC BLOCK=32 SECTORS

Fig.4

Fig. 5A

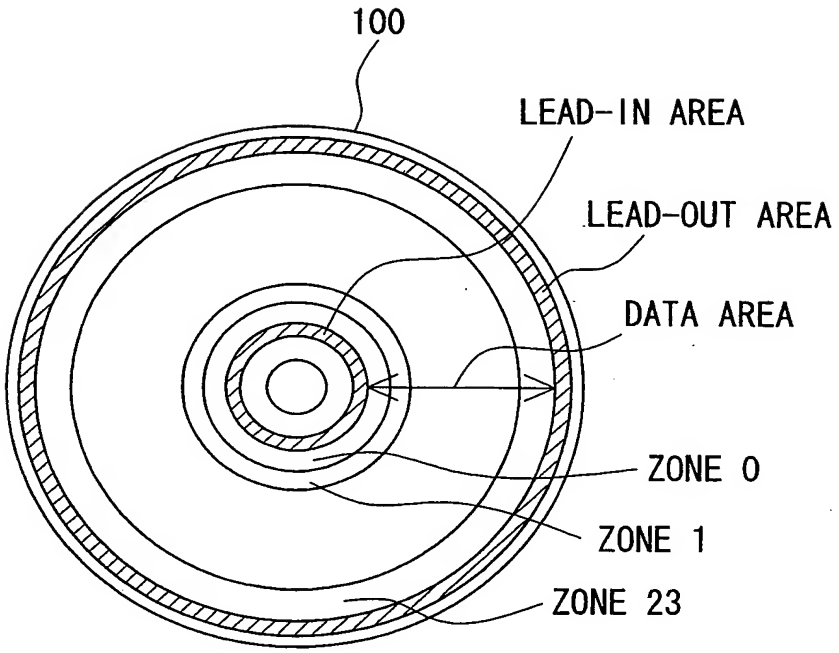
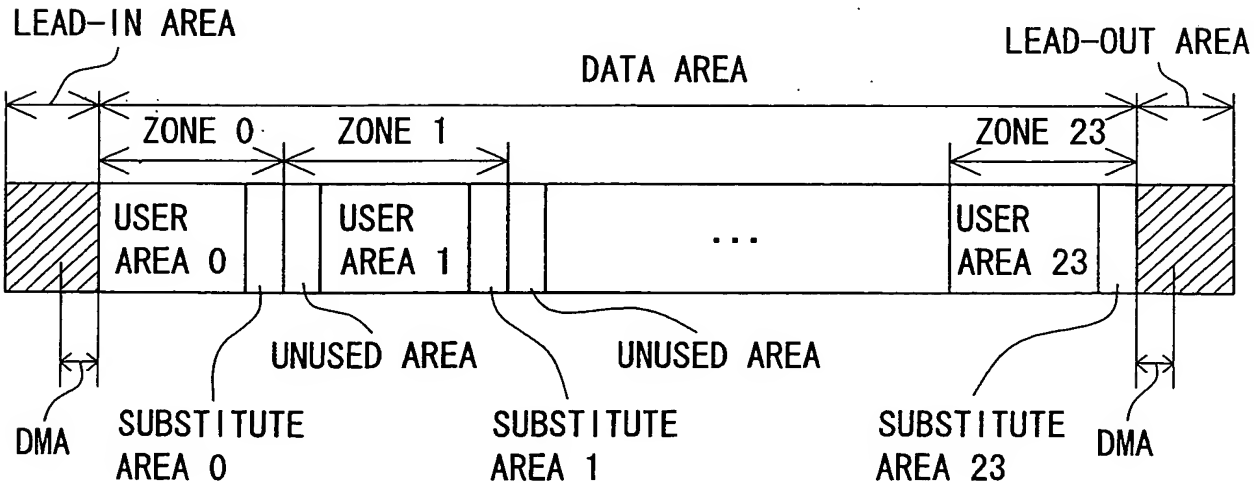

100
LEAD-IN AREA
LEAD-OUT AREA
DATA AREA
ZONE 0
ZONE 1
ZONE 23

Fig. 5B


LEAD-IN AREA
DATA AREA
LEAD-OUT AREA
ZONE 0
ZONE 1
ZONE 23
USER AREA 0
USER AREA 1
...
USER AREA 23
UNUSED AREA
UNUSED AREA
DMA
SUBSTITUTE AREA 0
SUBSTITUTE AREA 1
SUBSTITUTE AREA 23
DMA

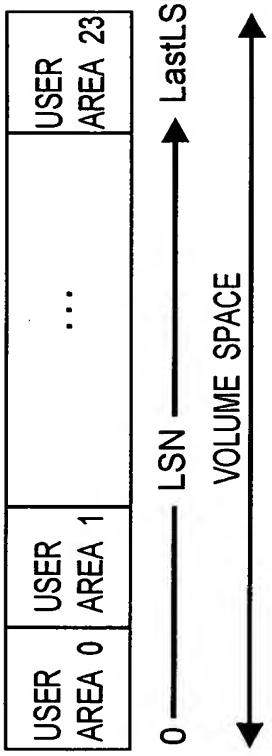

USER AREA 0
USER AREA 1
...
USER AREA 23
0
LSN
LastLSN
VOLUME SPACE

Fig.6A

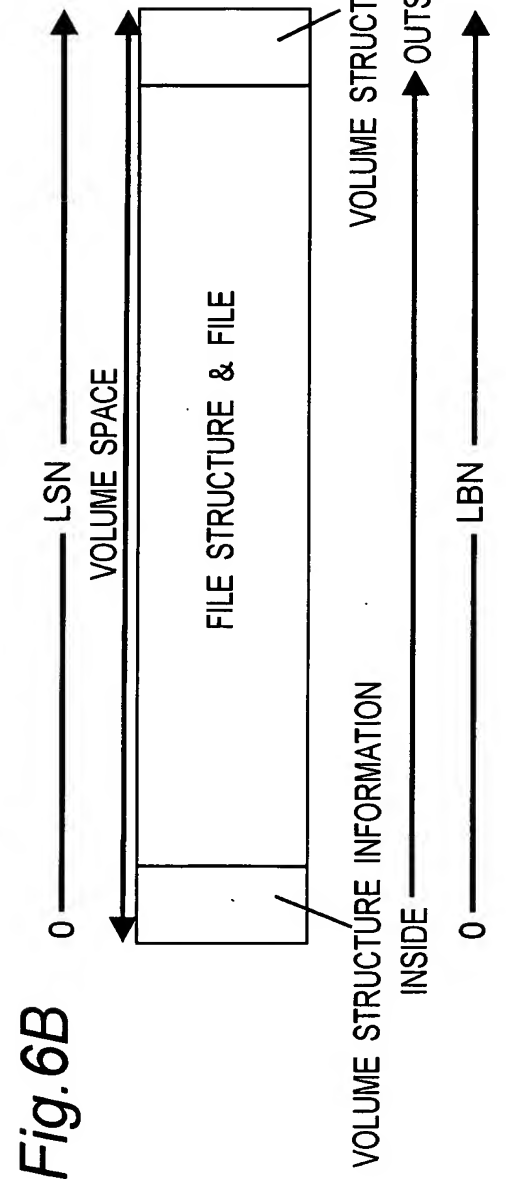

0
LSN
VOLUME SPACE
FILE STRUCTURE & FILE
VOLUME STRUCTURE INFORMATION
VOLUME STRUCTURE INFORMATION
INSIDE
OUTSIDE
0
LBN
LastLBN

Fig.6B

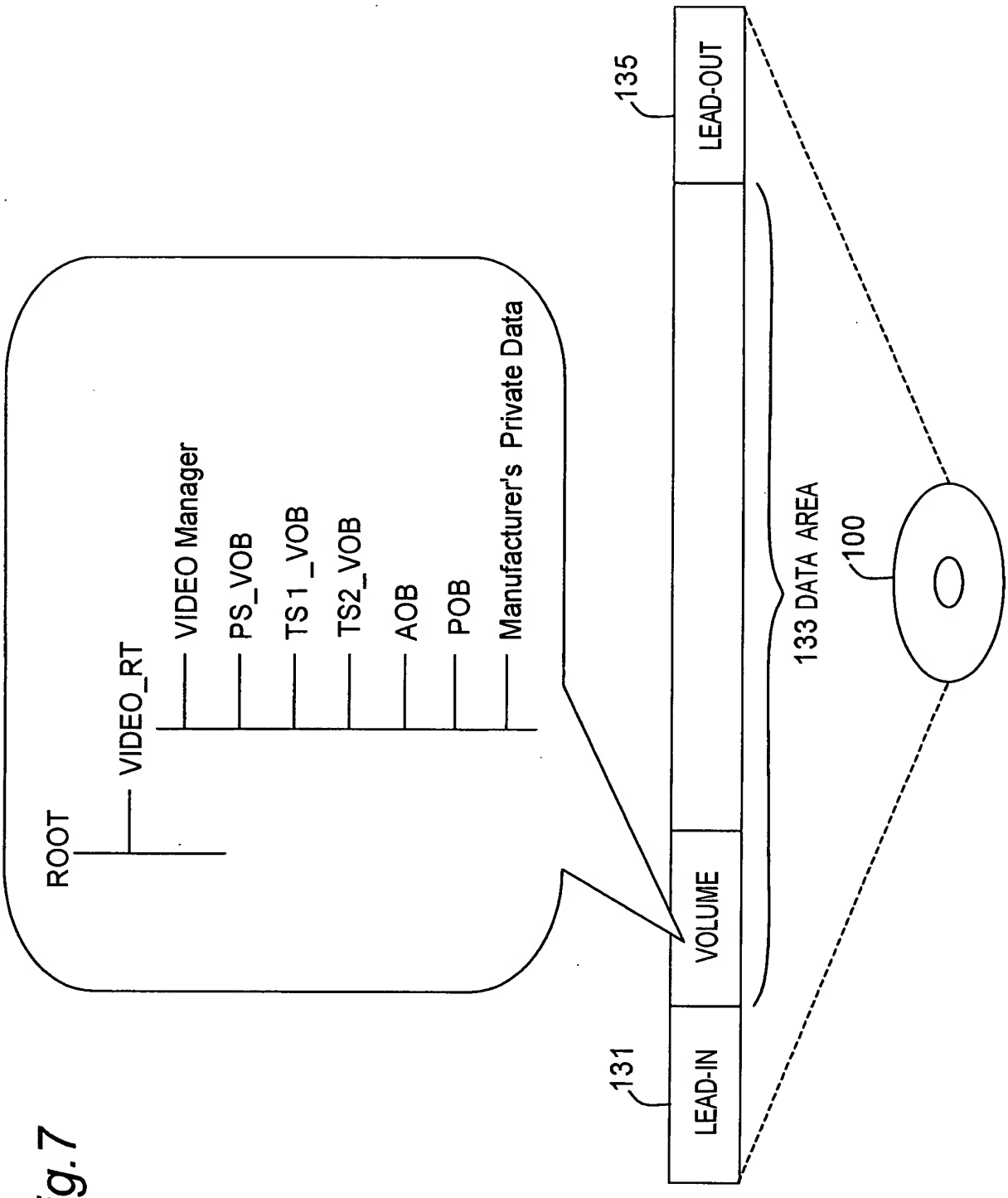

ROOT
VIDEO_RT
VIDEO Manager
PS_VOB
TS1_VOB
TS2_VOB
AOB
POB
Manufacturer's Private Data
131
LEAD-IN
VOLUME
133 DATA AREA
135
LEAD-OUT
100

Fig.7

Fig.8

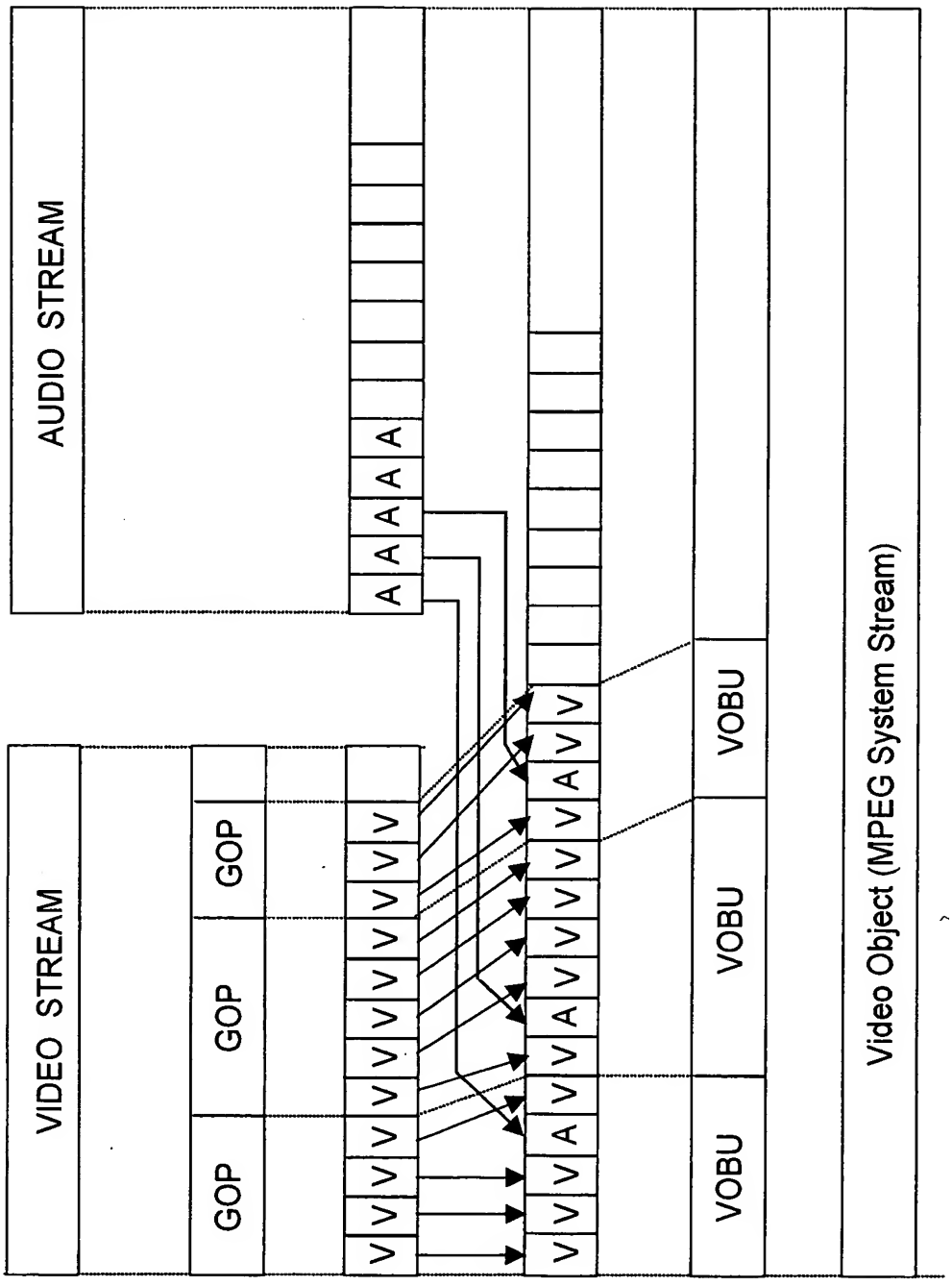
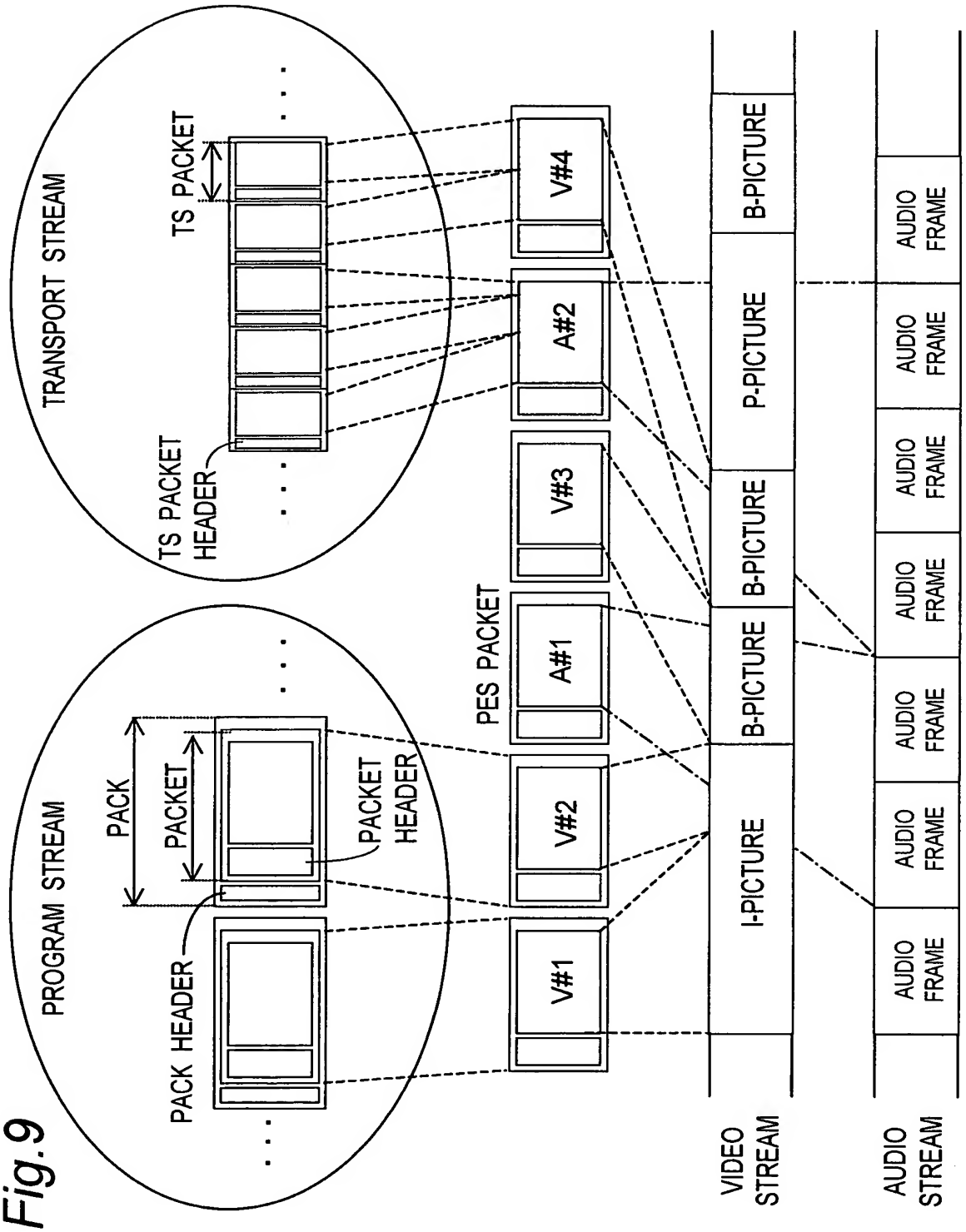

AUDIO STREAM
VIDEO STREAM
GOP
GOP
GOP
A
V
VOBU
VOBU
VOBU
Video Object (MPEG System Stream)

Fig.9


PROGRAM STREAM
PACK
PACKET
PACKET HEADER
PACK HEADER
TRANSPORT STREAM
TS PACKET
TS PACKET HEADER
PES PACKET
V#1
V#2
V#3
V#4
A#1
A#2
I-PICTURE
B-PICTURE
B-PICTURE
P-PICTURE
B-PICTURE
AUDIO FRAME
VIDEO STREAM
AUDIO STREAM

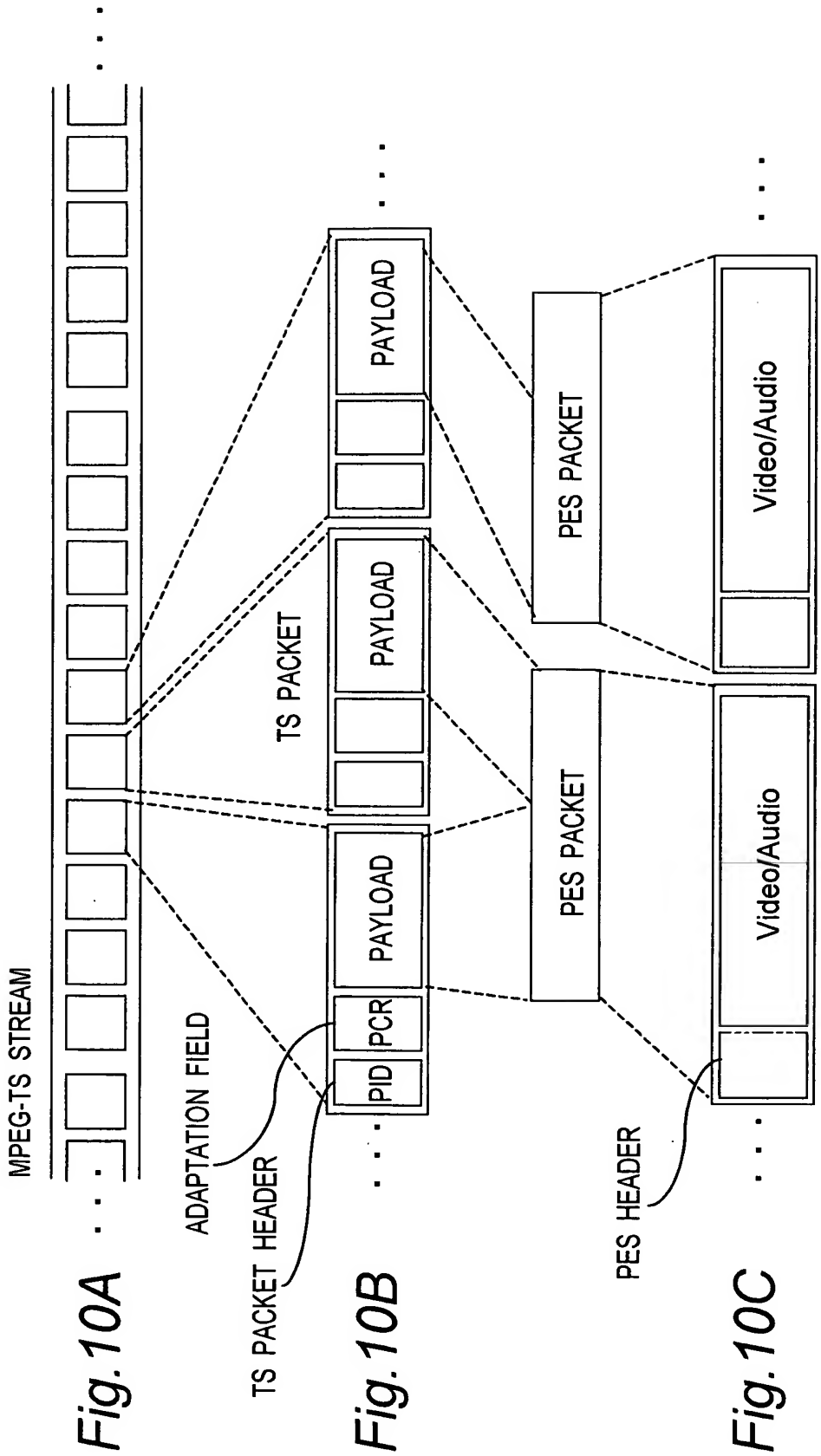


Fig.10A

Fig.10B

Fig.10C

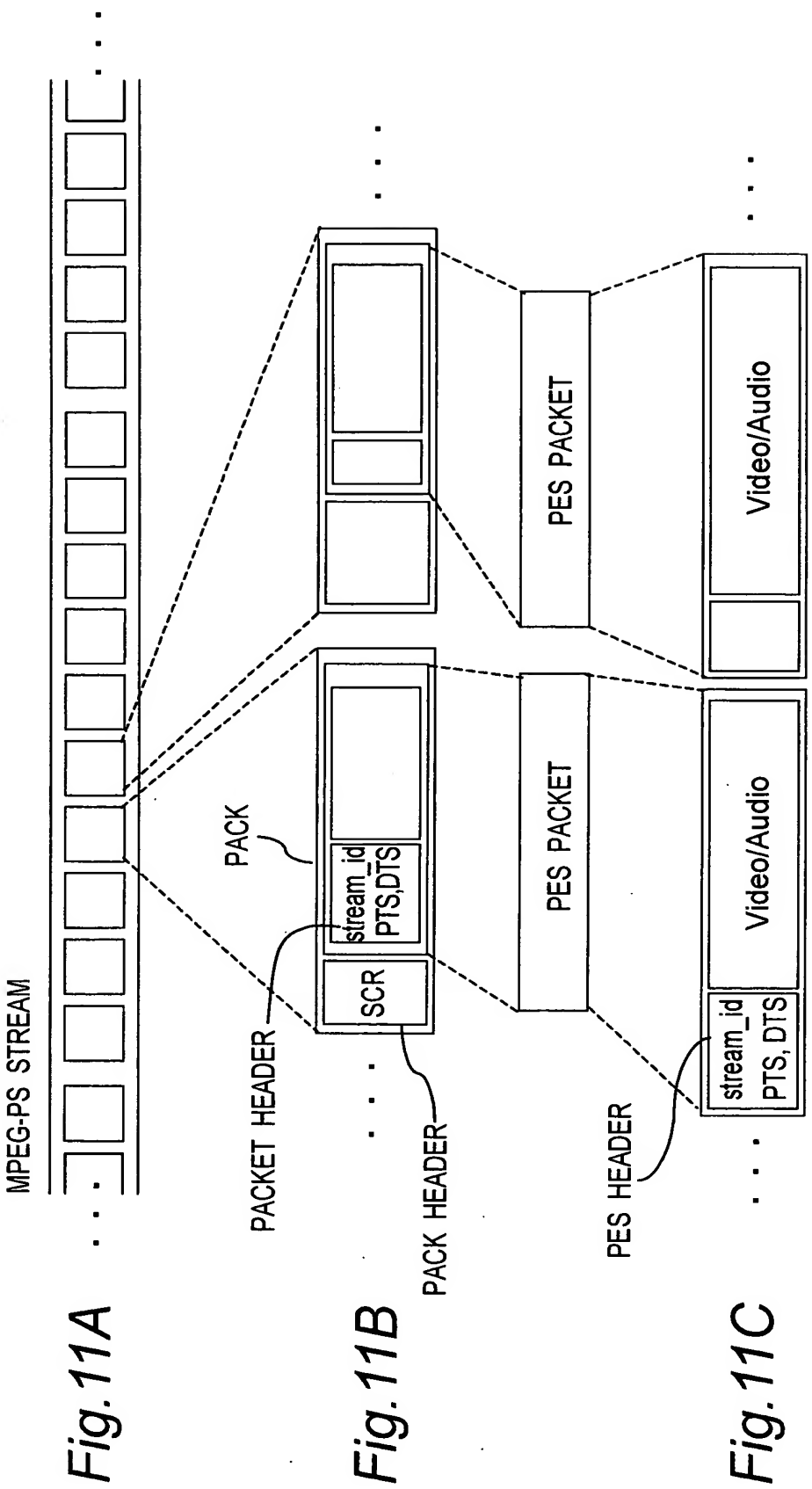


Fig.11A

Fig.11B

Fig.11C

Fig.12A

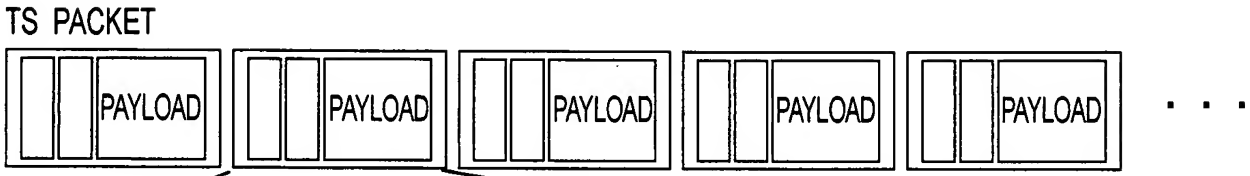


Fig.12B

Fig.12C

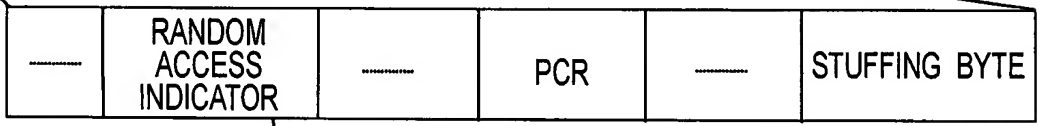
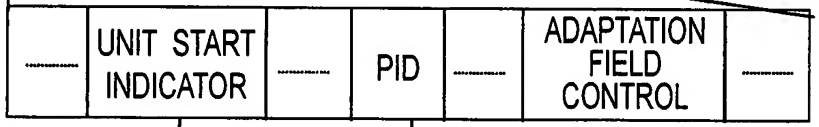


Fig.12D



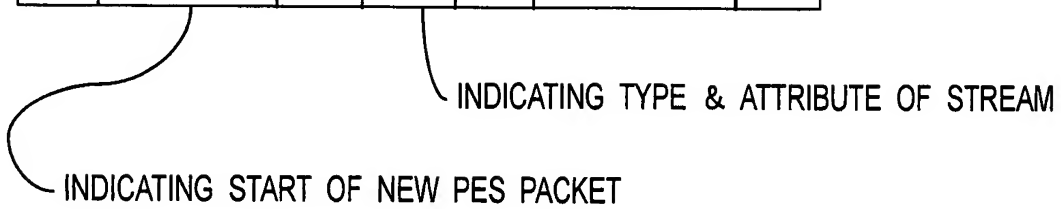


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Fig.13A

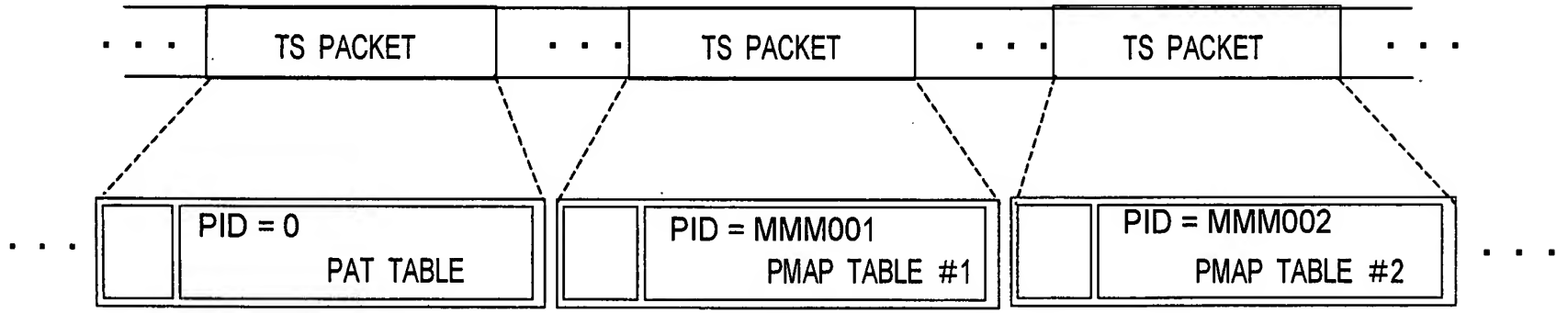

Fig.13B

PAT TABLE

PROGRAM 1	PMAP TABLE #1
PROGRAM 2	PMAP TABLE #2
⋮	⋮
PROGRAM n	PMAP TABLE #n

Fig.13C1

PMAP TABLE #1

Video	PID=vv001
Audio	PID=aa002

Fig.13C2

PMAP TABLE #2

Video	PID=vv002
Audio	PID=aa001

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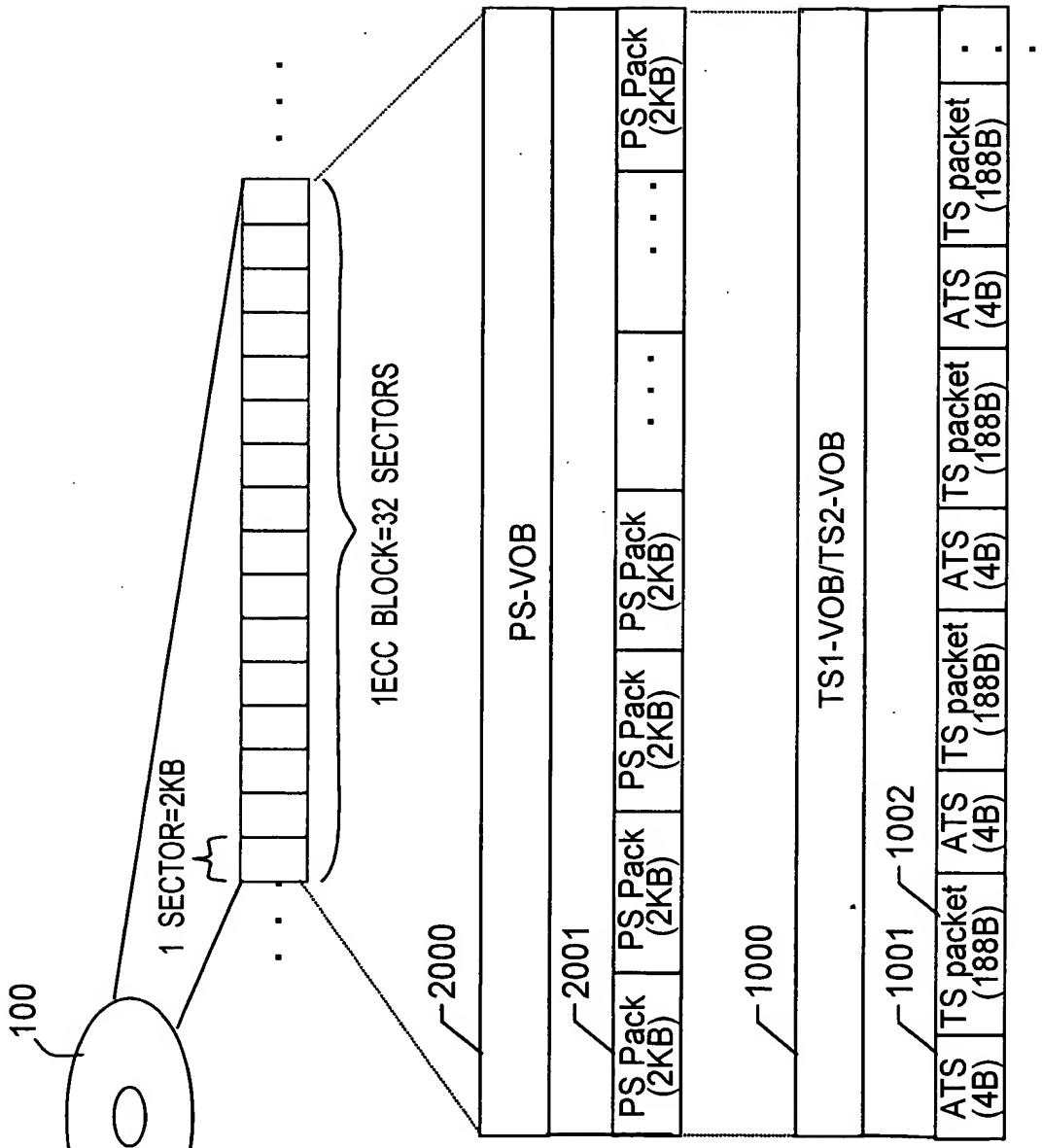

Fig.14A

Fig.14B

Fig.14C

Fig.15A

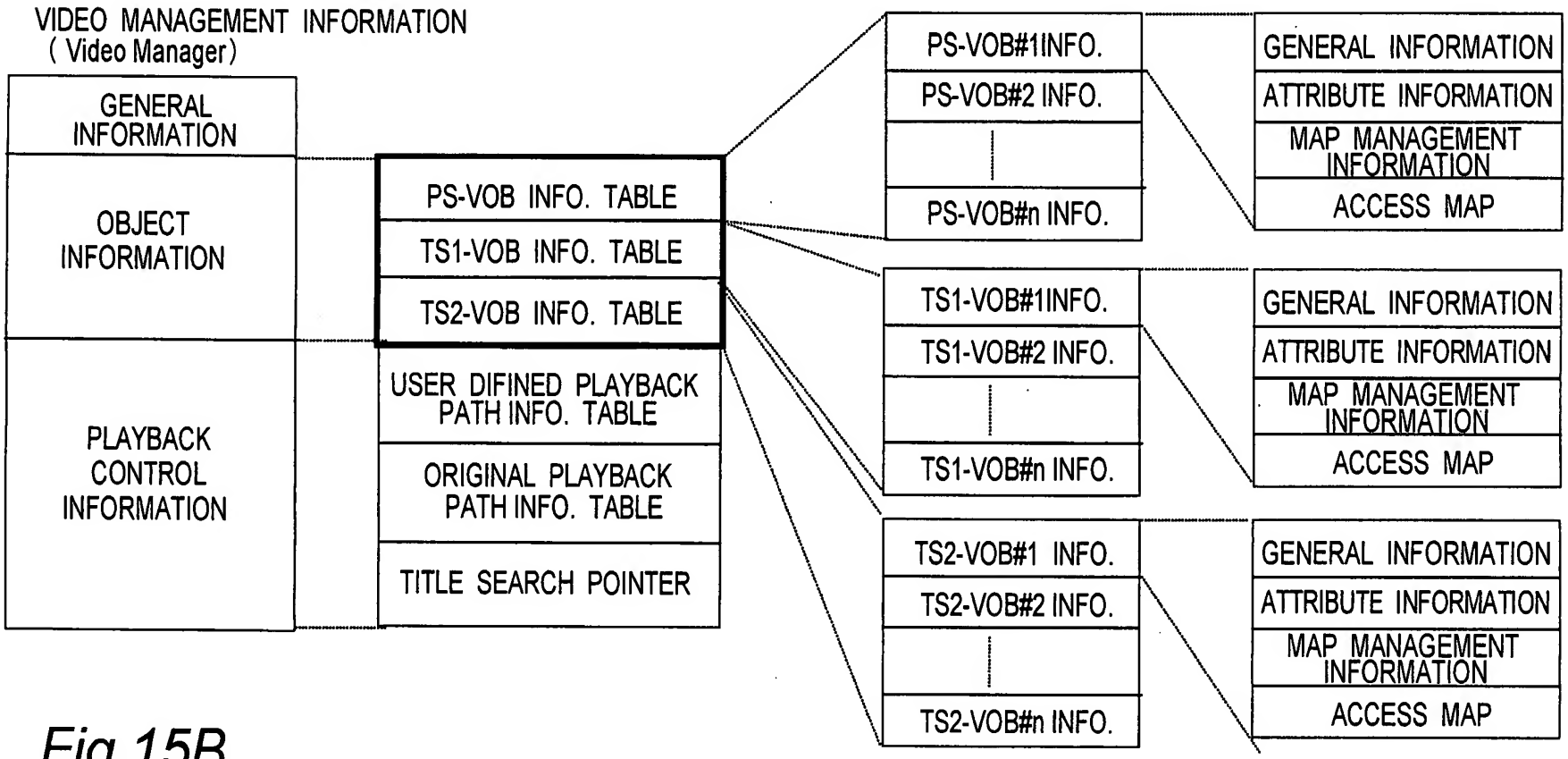

Fig.15B

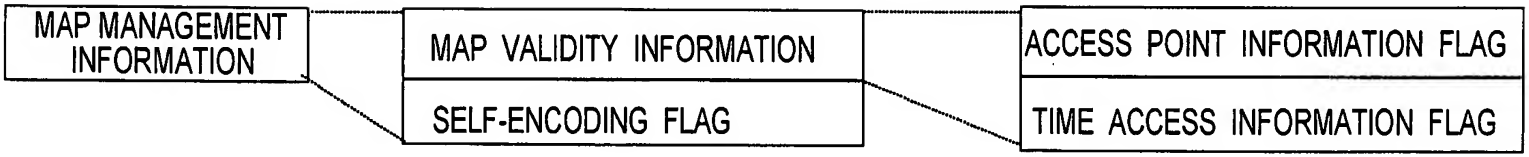

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Fig.16A

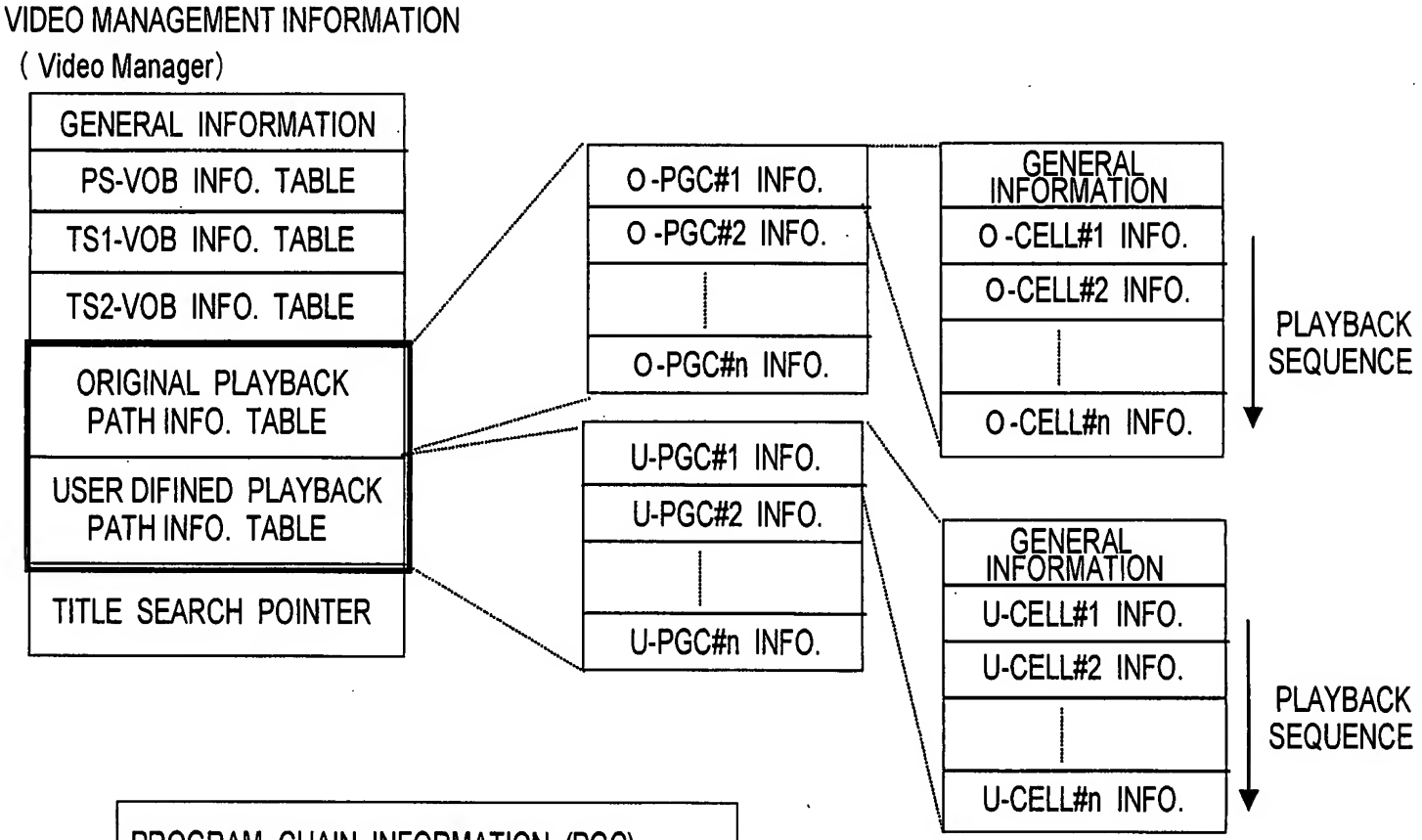

Fig.16B

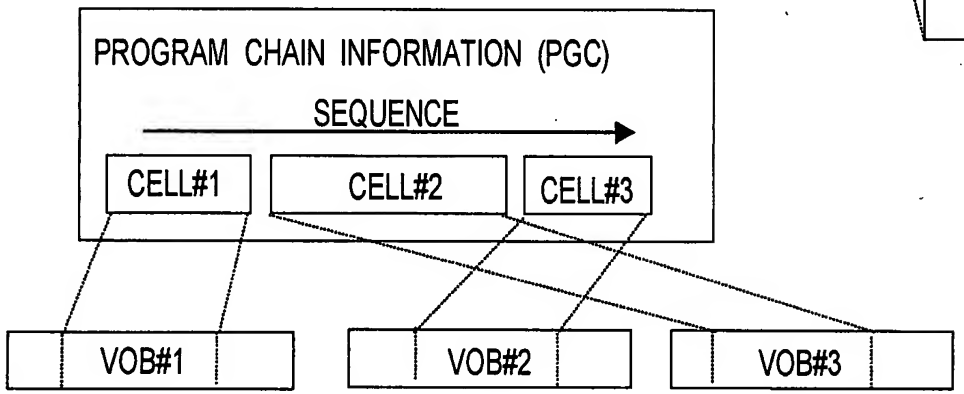

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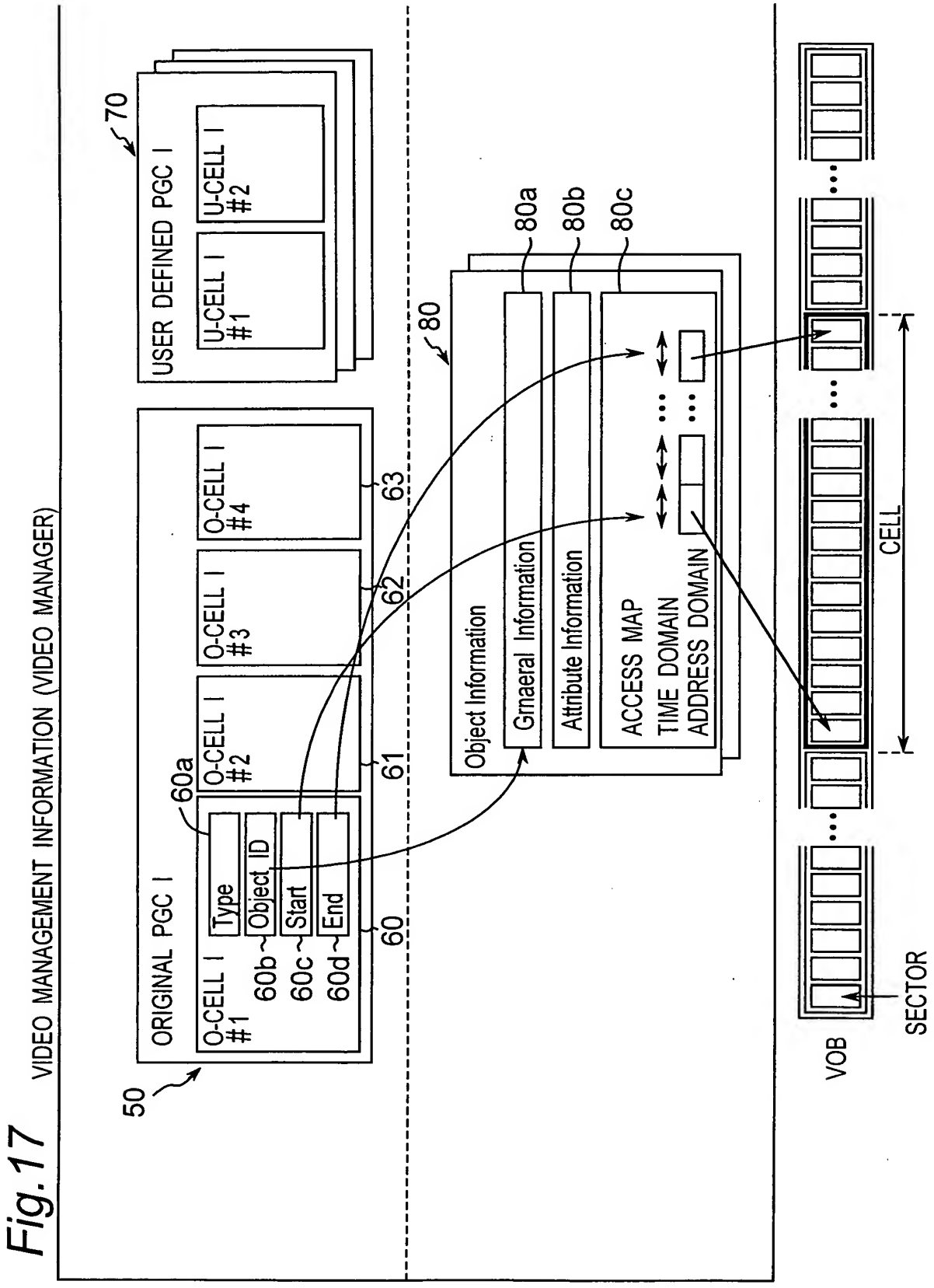
Fig.17


VIDEO MANAGEMENT INFORMATION (VIDEO MANAGER)
50
ORIGINAL PGC I
O-CELL I #1
O-CELL I #2
O-CELL I #3
O-CELL I #4
60a
Type
Object ID
Start
End
60b
60c
60d
60
61
62
63
70
USER DEFINED PGC I
U-CELL I #1
U-CELL I #2
80
80a
80b
80c
Object Information
Gnaeral Information
Attribute Information
ACCESS MAP
TIME DOMAIN
ADDRESS DOMAIN
VOB
CELL
SECTOR

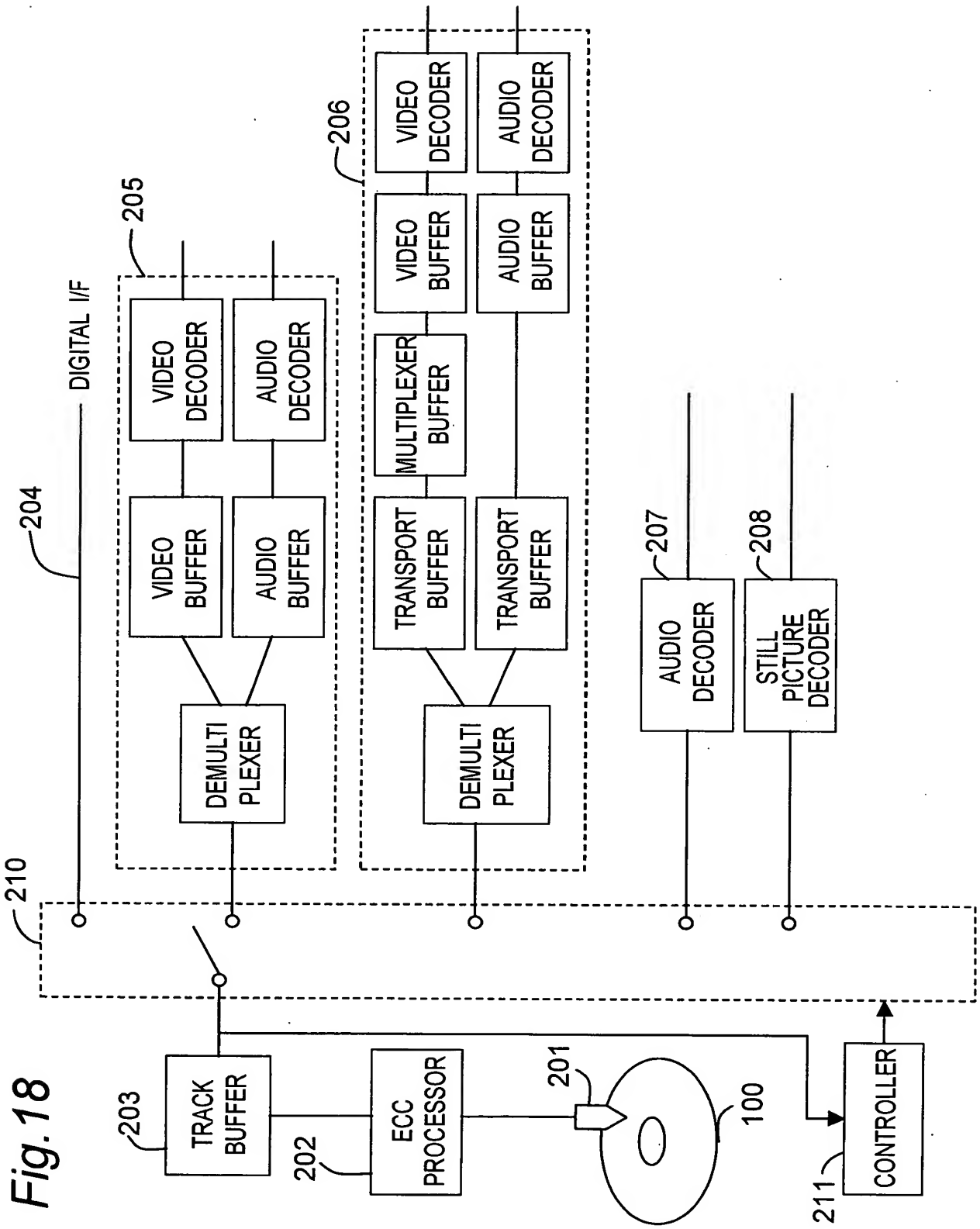

DIGITAL I/F
204
205
206
VIDEO DECODER
AUDIO DECODER
VIDEO BUFFER
AUDIO BUFFER
DEMULTI PLEXER
MULTIPLEXER BUFFER
TRANSPORT BUFFER
207
208
AUDIO DECODER
STILL PICTURE DECODER
210
203
TRACK BUFFER
202
ECC PROCESSOR
201
100
211
CONTROLLER

Fig.18

Fig. 19

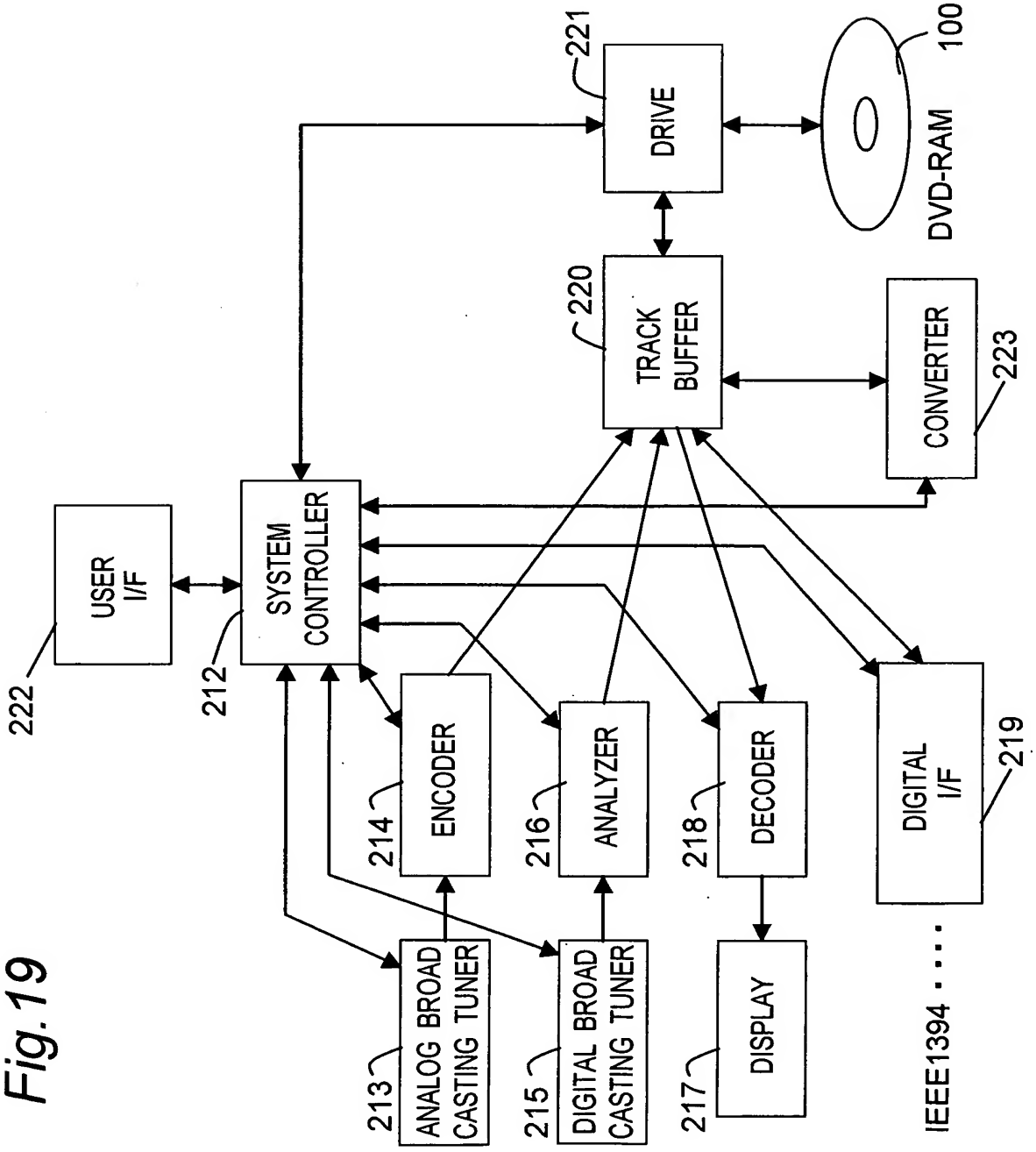

USER I/F
222
SYSTEM CONTROLLER
212
DRIVE
221
DVD-RAM
100
TRACK BUFFER
220
CONVERTER
223
ENCODER
214
ANALYZER
216
DECODER
218
DIGITAL I/F
219
ANALOG BROAD CASTING TUNER
213
DIGITAL BROAD CASTING TUNER
215
DISPLAY
217
IEEE1394 . . . .

Fig.20

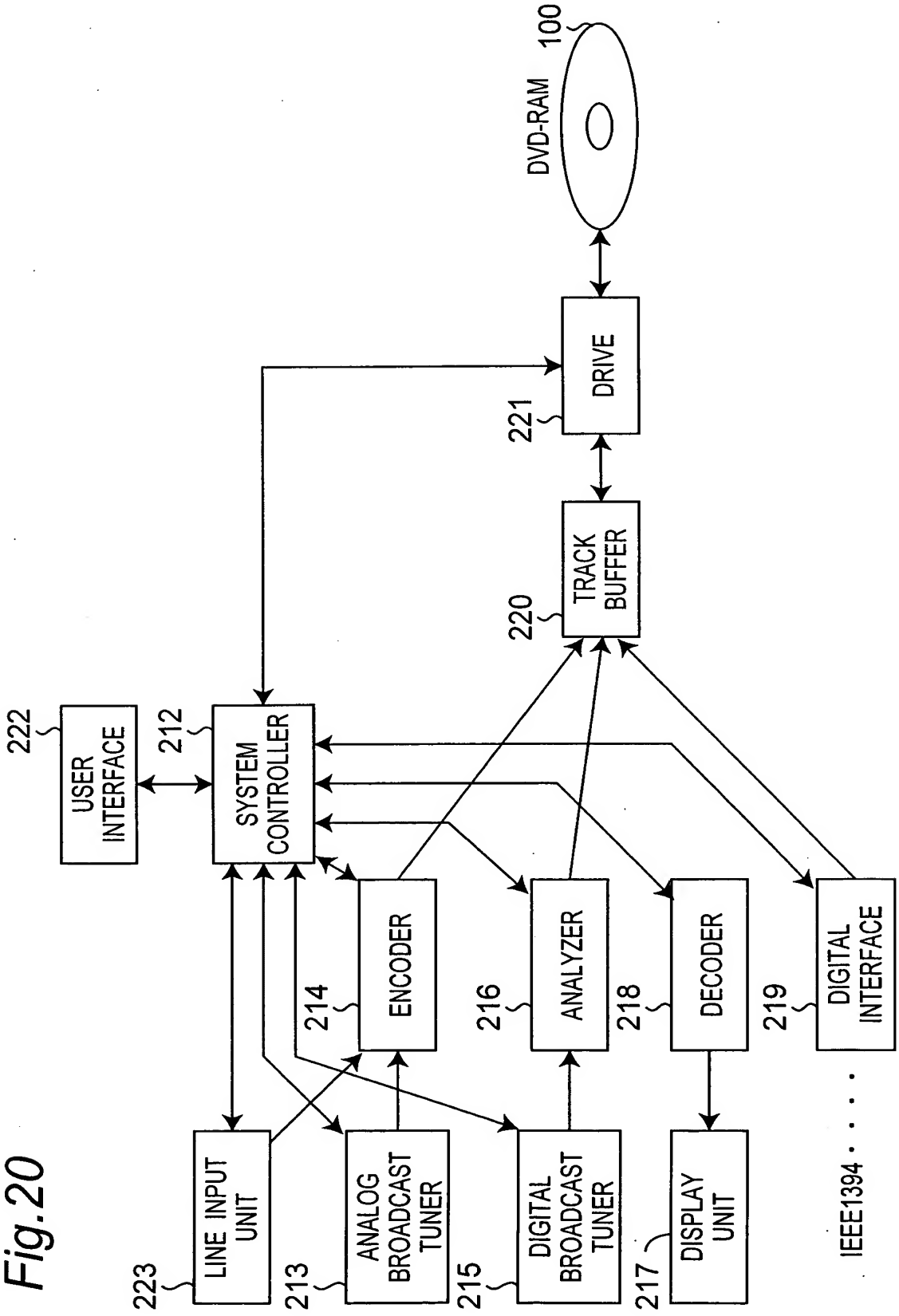

DVD-RAM
100
DRIVE
221
TRACK BUFFER
220
USER INTERFACE
222
SYSTEM CONTROLLER
212
ENCODER
214
ANALYZER
216
DECODER
218
DIGITAL INTERFACE
219
LINE INPUT UNIT
223
ANALOG BROADCAST TUNER
213
DIGITAL BROADCAST TUNER
215
DISPLAY UNIT
217
IEEE1394

Fig.21A

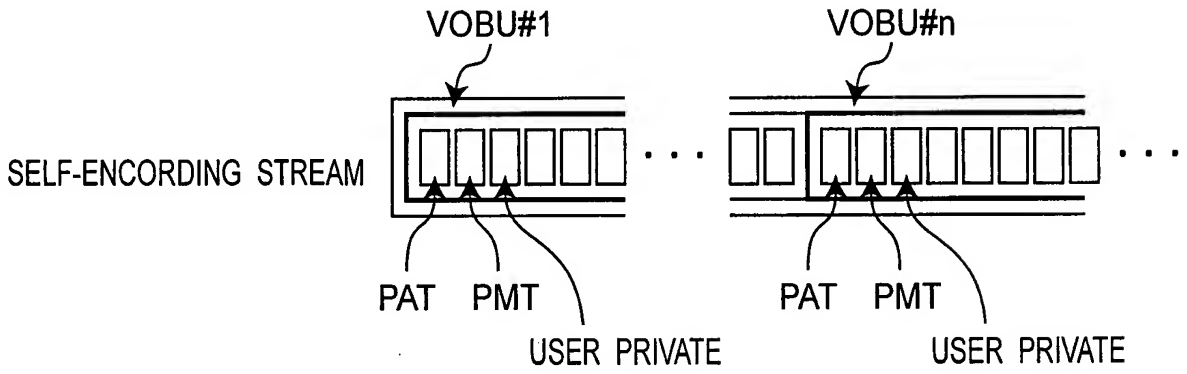


Fig.21B

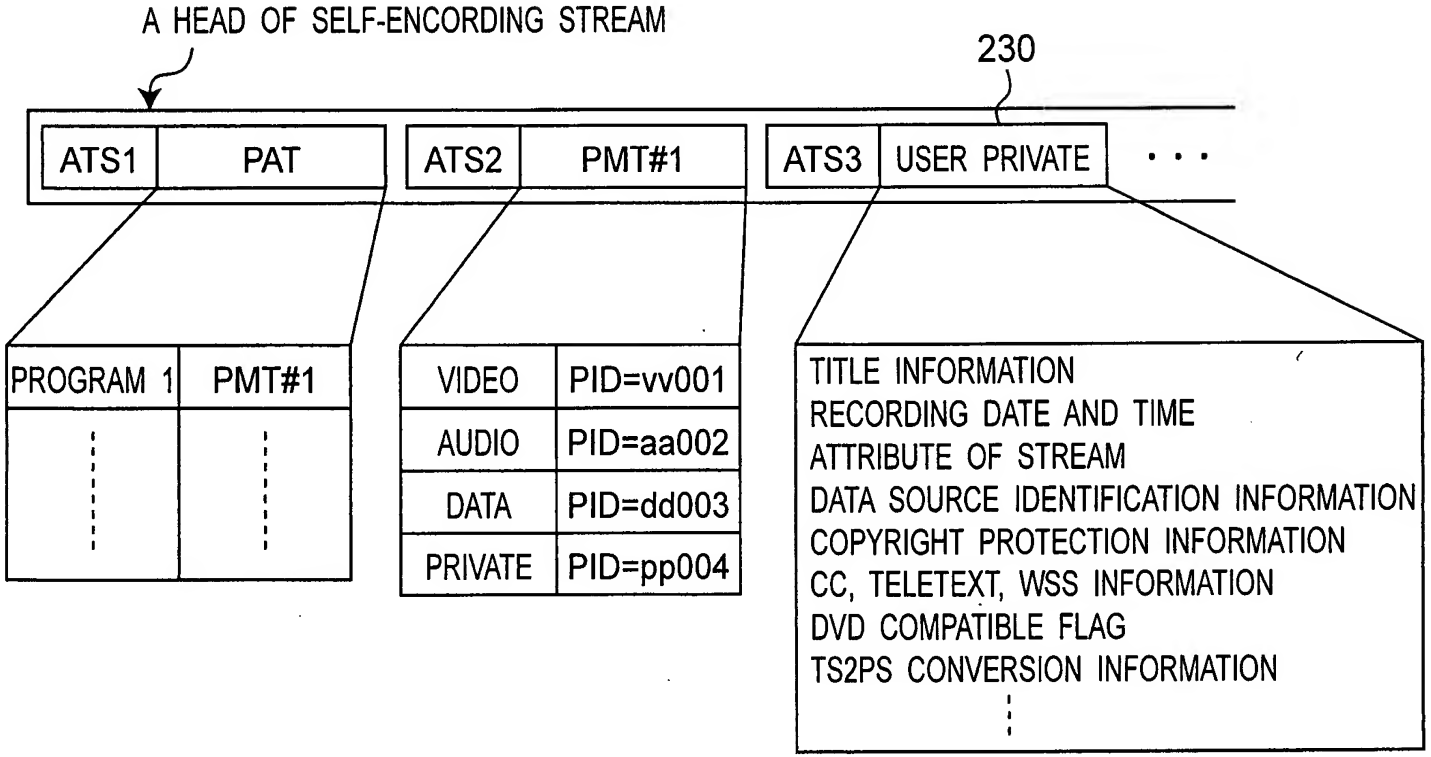


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Fig.22A

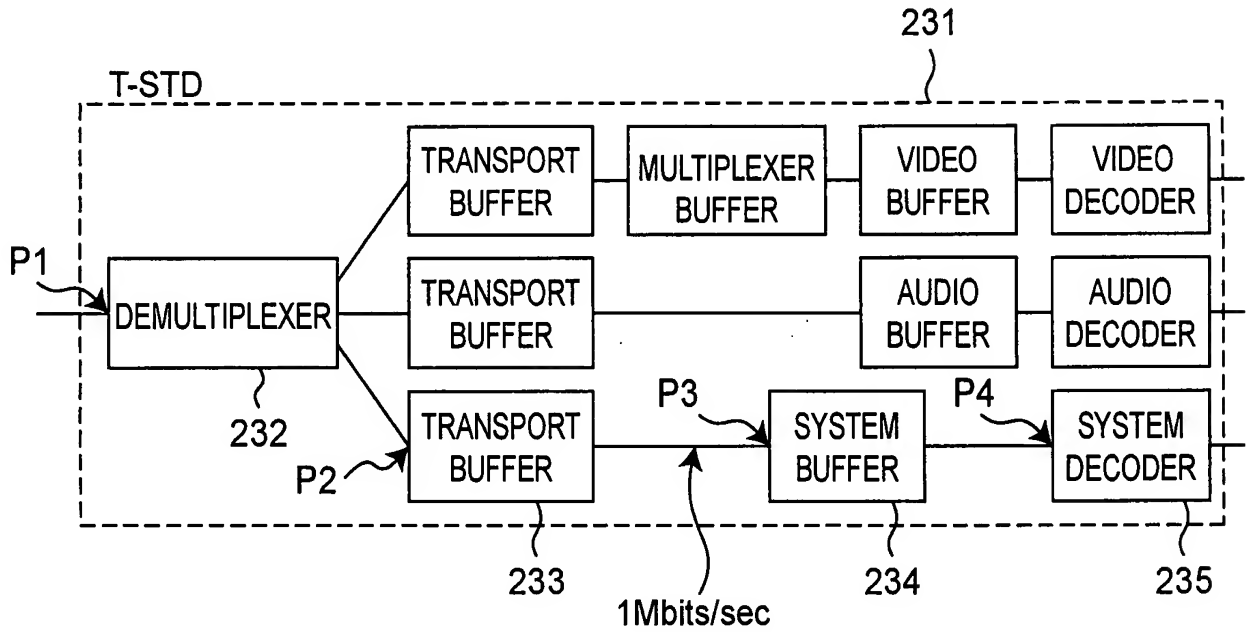

Fig.22B

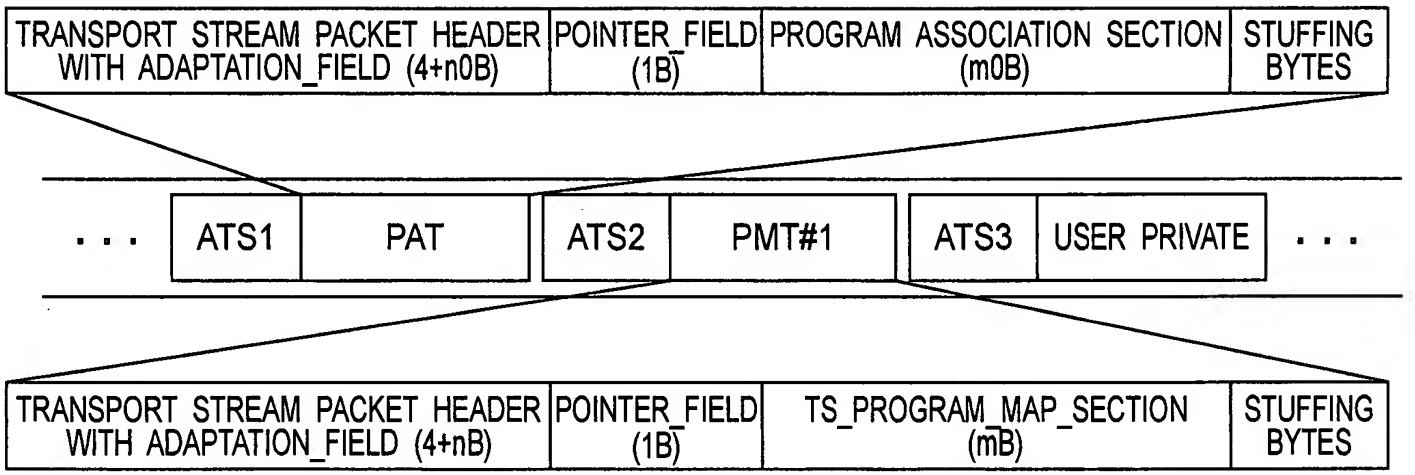

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Fig. 23

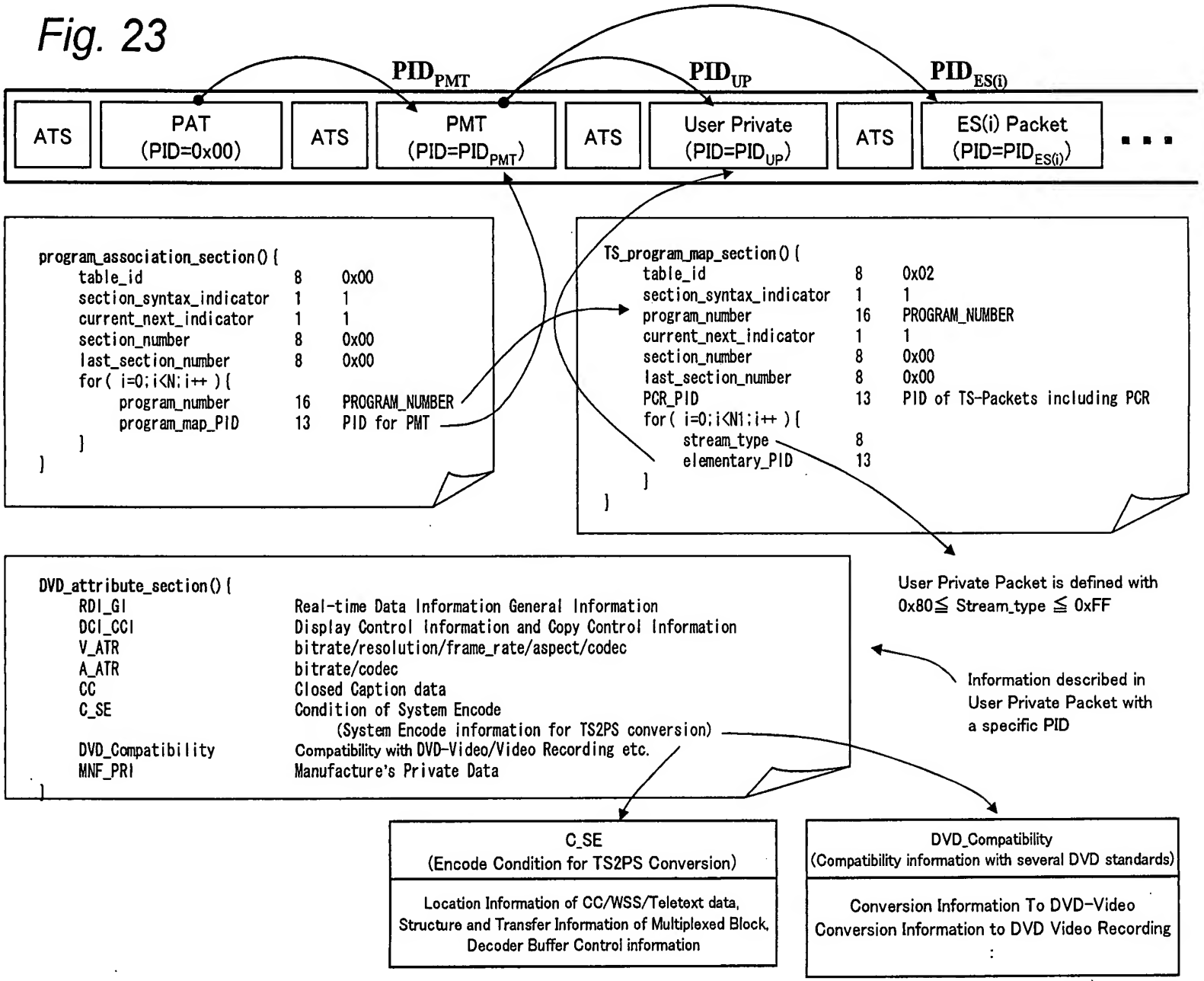

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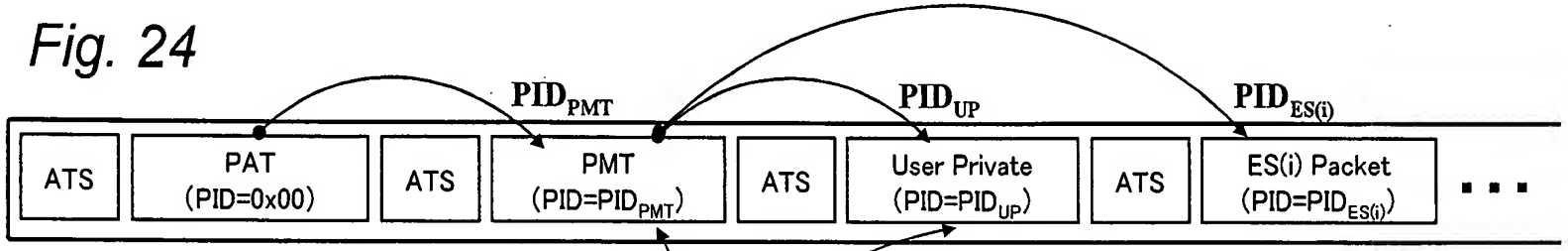
Fig. 24




```
program_association_section() {
    table_id                  8    0x00
    section_syntax_indicator  1    1
    current_next_indicator    1    1
    section_number            8    0x00
    last_section_number       8    0x00
    for( i=0;i<N;i++ ){
        program_number        16   PROGRAM_NUMBER
        program_map_PID       13   PID for PMT
    }
}
```

```
TS_program_map_section() {
    table_id                  8    0x02
    section_syntax_indicator  1    1
    program_number            16   PROGRAM_NUMBER
    current_next_indicator    1    1
    section_number            8    0x00
    last_section_number       8    0x00
    PCR_PID                   13   PID of TS-Packets including PCR
    for( i=0;i<N1;i++ ){
        stream_type           8
        elementary_PID        13
    }
}
```

User Private Packet is defined with Stream_type = 0x05

```
private_section() {
    table_id                  0x40 ~ 0xFE for User Private
    section_syntax_indicator  Data Structure Identification flag of private_section()
    private_section_length    Byte length of private_section() following private_section_length
    table_id_extension        only when secton_syntax_indicator = 1
    version_number            only when secton_syntax_indicator = 1
    current_next_indicator    only when secton_syntax_indicator = 1
    section_number            only when secton_syntax_indicator = 1
    last_section_number       only when secton_syntax_indicator = 1
        RDI_GI                Real-time Data Information General Information
        DCI_CCI               Display Control Information and Copy Control Information
        V_ATR                 bitrate/resolution/frame_rate/aspect/codec
        A_ATR                 bitrate/codec
        CC                    Closed Caption data
        C_SE                  Condition of System Encode
                              ( System Encode information for TS2PS conversion )
        DVD_Compatibility     Compatibility with DVD-Video/Video Recording etc.
        MNF_PRI               Manufacture's Private Data
    CRC_32                    only when secton_syntax_indicator = 1
}
```

Information described in User Private Packet with a specific PID

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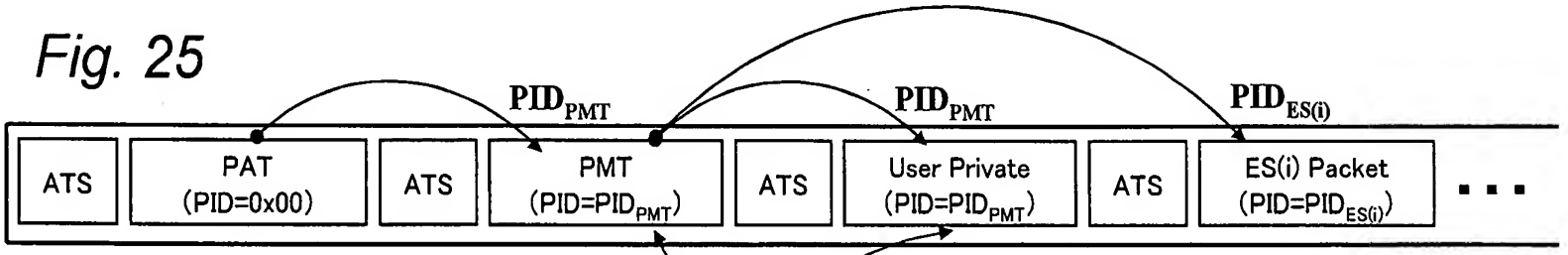
Fig. 25




```
program_association_section() {
    table_id                    8    0x00
    section_syntax_indicator    1    1
    current_next_indicator      1    1
    section_number              8    0x00
    last_section_number         8    0x00
    for( i=0;i<N;i++ ){
        program_number          16   PROGRAM_NUMBER
        program_map_PID         13   PID for PMT
    }
}
```

```
TS_program_map_section() {
    table_id                    8    0x02
    section_syntax_indicator    1    1
    program_number              16   PROGRAM_NUMBER
    current_next_indicator      1    1
    section_number              8    0x00
    last_section_number         8    0x00
    PCR_PID                     13   PID of TS-Packets including PCR
    for( i=0;i<N1;i++ ){
        stream_type             8
        elementary_PID          13
    }
}
```

User Private Packet is not defined but PID of PMT Packet is added.

```
private_section() {
    table_id                    0x40 ~ 0xFE for User Private
    section_syntax_indicator    Data Structure Identification flag of private_section()
    private_section_length      Byte length of private_section() following private_section_length
    table_id_extension          only when secton_syntax_indicator = 1
    version_number              only when secton_syntax_indicator = 1
    current_next_indicator      only when secton_syntax_indicator = 1
    section_number              only when secton_syntax_indicator = 1
    last_section_number         only when secton_syntax_indicator = 1
        RDI_GI                  Real-time Data Information General Information
        DCI_CCI                 Display Control Information and Copy Control Information
        V_ATR                   bitrate/resolution/frame_rate/aspect/codec
        A_ATR                   bitrate/codec
        CC                      Closed Caption data
        C_SE                    Condition of System Encode
                                ( System Encoding information for TS2PS Conversion)
        DVD_Compatibility       Compatibility with DVD-Video/Video Recording etc.
        MNF_PRI                 Manufacture's Private Data
    CRC_32                      only when secton_syntax_indicator = 1
}
```

Information described in User Private Packet with the same PID as PMT

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Fig. 26

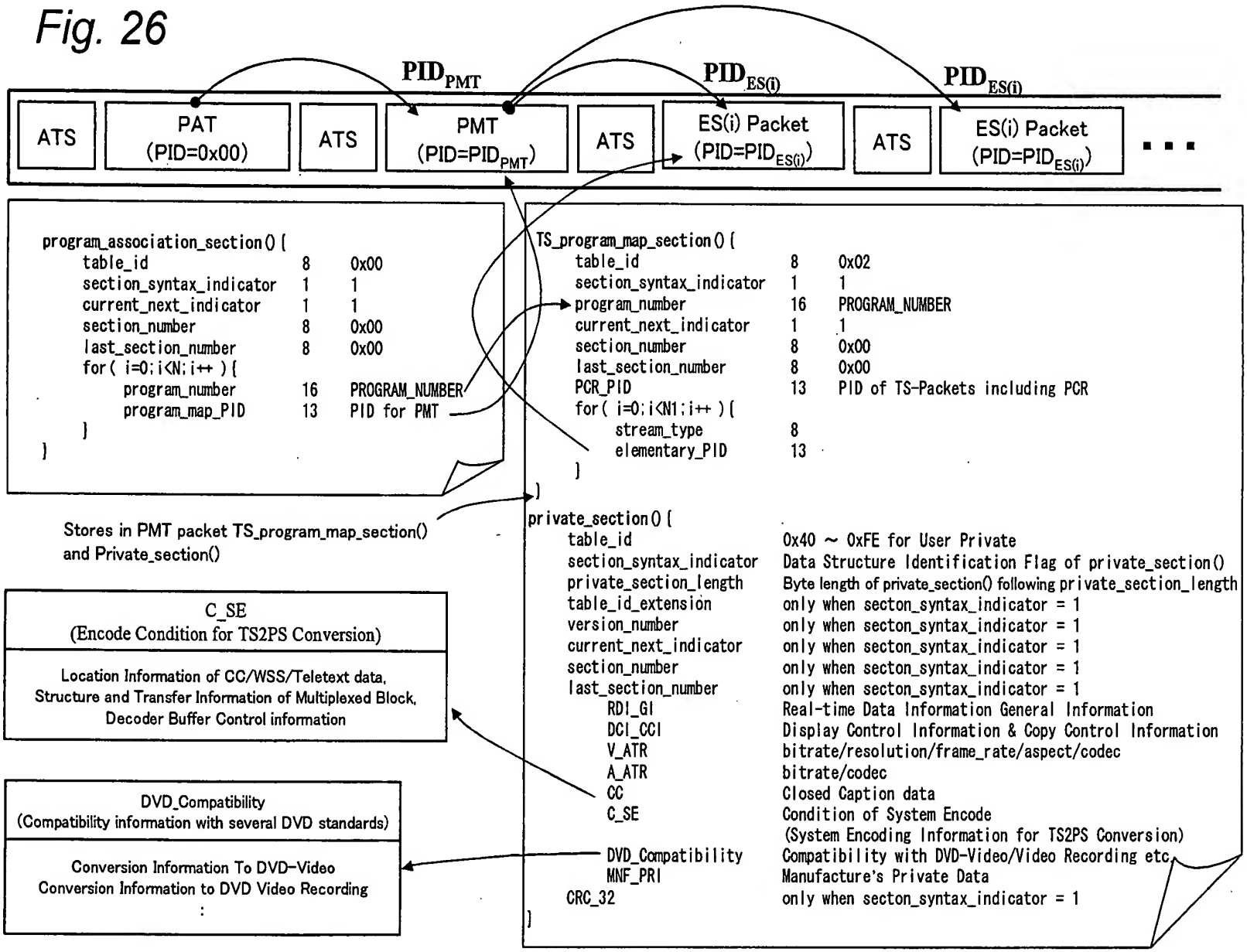

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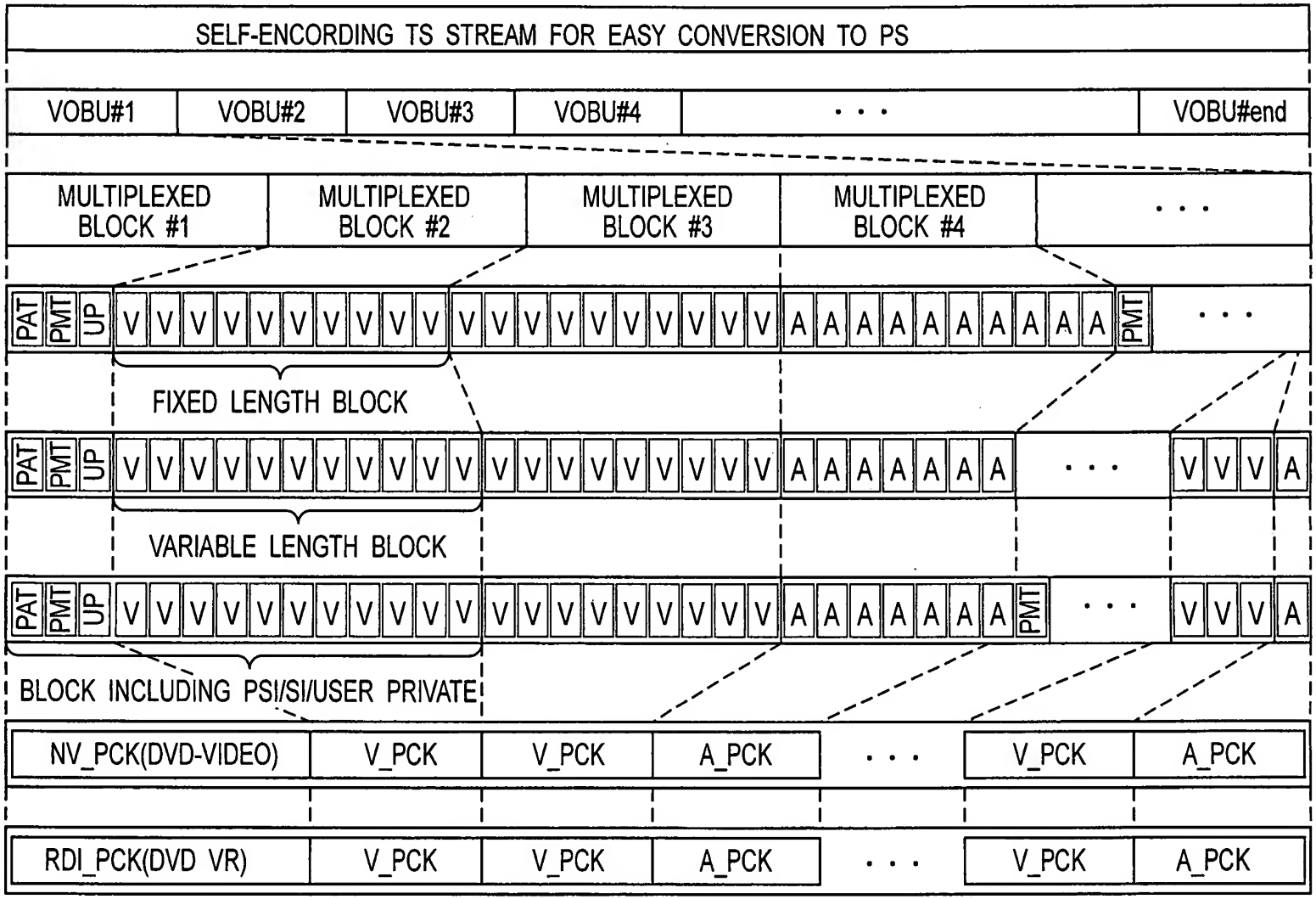
Fig.27A



(*) CAPSULE HEADER AND ATS ARE OMITTED.
(*) EACH PACK IN FIGS. 27G AND 27H ARE STUFFED/PADDED ACCORDING TO BYTE LENGTH OF ELEMENTARY OR VOBU ALIGNMENT.

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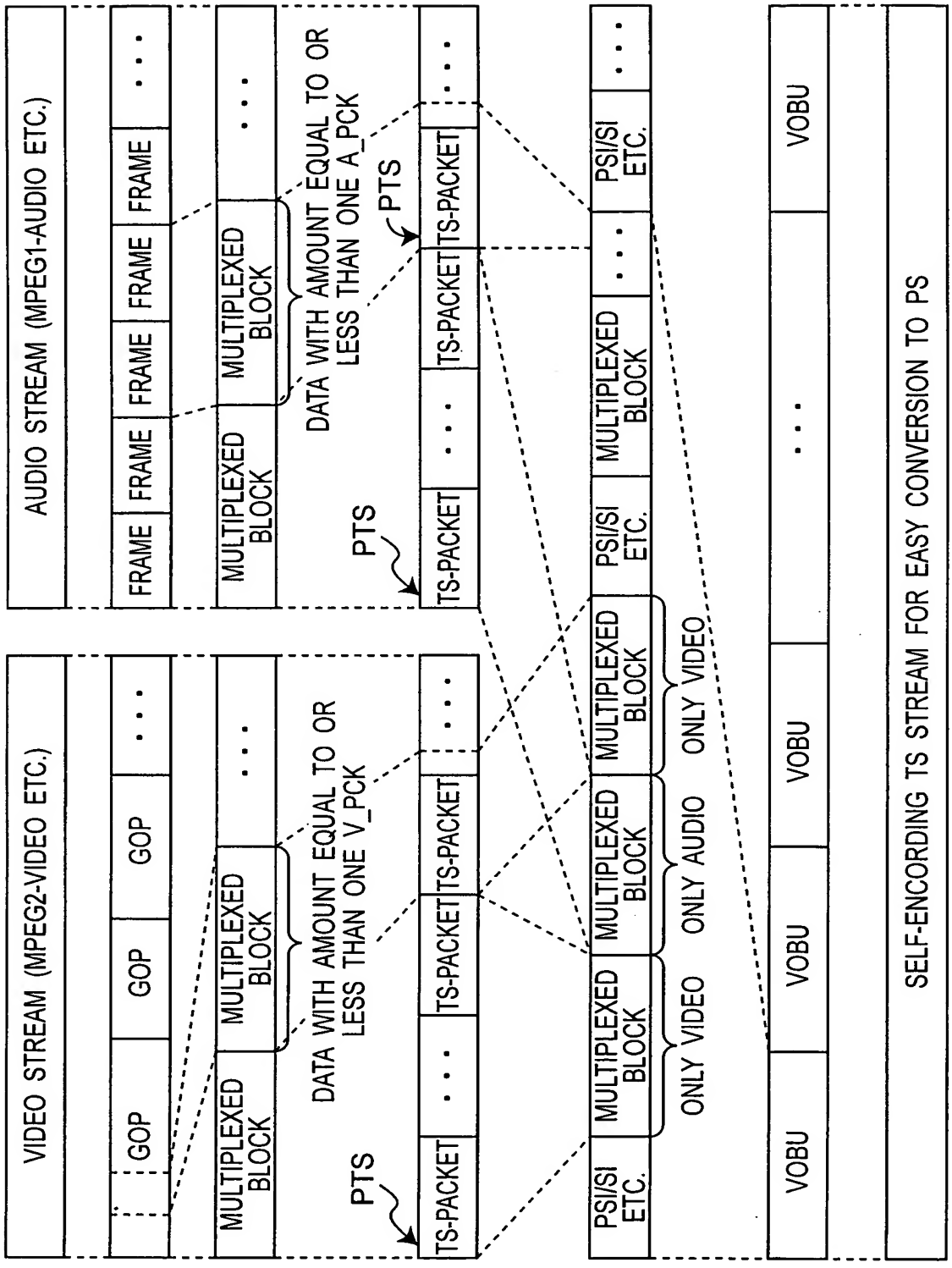


Fig.28A

Fig.28B

Fig.28C

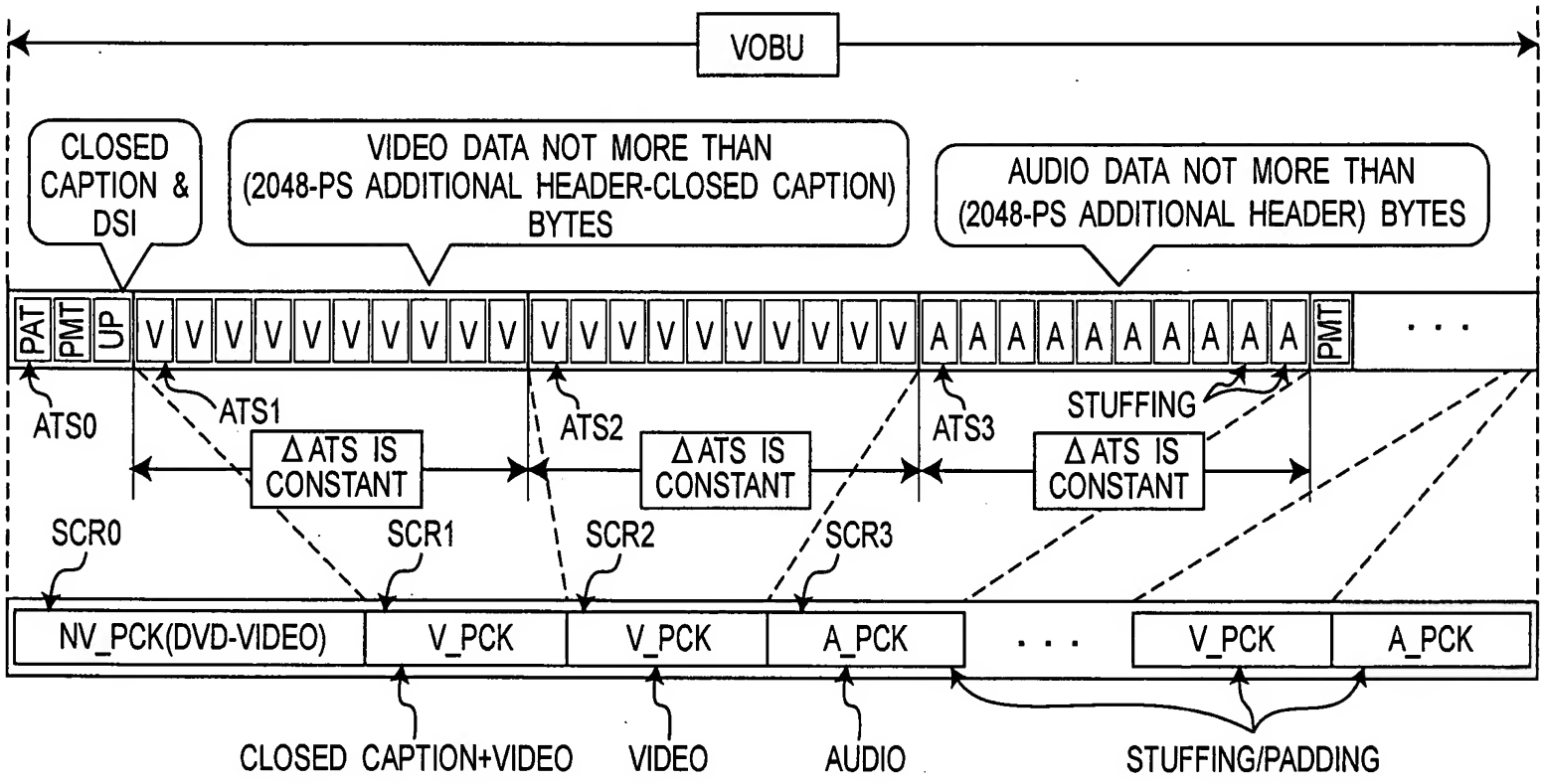
Fig.28D

Fig.28E

Fig.28F

Fig.28G

Fig.29



ATSi (+CONSTANT)=SCRi
ATSi (+NUMBER OF PACKETS IN THE MULTIPLEXED BLOCK)*ΔATS≦ATSi+1
ATSi (+NUMBER OF PACKETS IN THE MULTIPLEXED BLOCK)*ΔATS<ATSi+1
SCRi+1−SCRi≧8*2048*27*/10.08

FOR ALL i
FOR FIXED LENGTH MULTIPLEXED BLOCK
FOR VARIABLE LENGTH MULTIPLEXED BLOCK
MPEG−PS MUX_RATE=10.08 Mbps

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Fig.30

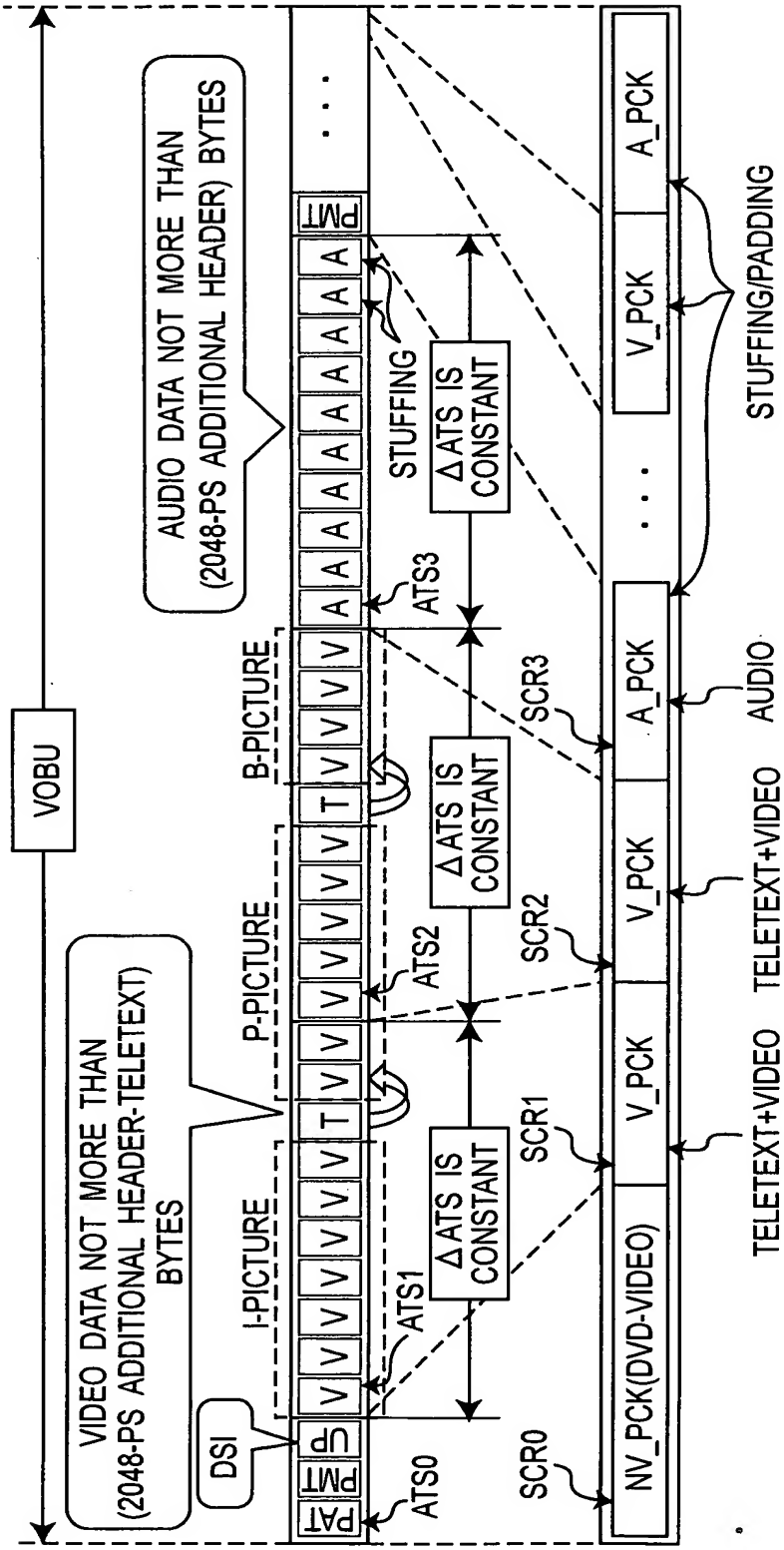
VOBU
VIDEO DATA NOT MORE THAN (2048-PS ADDITIONAL HEADER-TELETEXT) BYTES
AUDIO DATA NOT MORE THAN (2048-PS ADDITIONAL HEADER) BYTES
DSI
I-PICTURE
P-PICTURE
B-PICTURE
PAT
PMT
V
T
A
STUFFING
ΔATS IS CONSTANT
ATS0
ATS1
ATS2
ATS3
SCR0
SCR1
SCR2
SCR3
NV_PCK(DVD-VIDEO)
V_PCK
A_PCK
TELETEXT+VIDEO
AUDIO
STUFFING/PADDING

Fig. 31

```
User_Private_transport_packet() {
    sync_byte                                   8b      0x47
    transport_error_indicator                   1b
    payload_unit_start_indicator                1b
    transport_priority                          1b
    PID                                         13b
    transport_scrambling_control                2b
    adaptation_field_control                    2b      01b             // no adaptation_field, payload only
    continuity_counter                          4b
    pointer_field                               8b      0x00            // no stuffing before private_section()
    private_section() {
        table_id                                8b      0xBF            // 0x40-0xFE for User private
        section_syntax_indicator                1b      0               // short version of private_section()
        private_indicator                       1b      0               // reserved for future use
        reserved                                2b      11b
        private_section_length                  12b     180             // following private_data_byte length

        RDI_GI (Real-time Data Information General Information)
            VOBU_S_PTM                          6B      presentation starting time of this VOBU         // same as DVD VR spec.
            Line21_data_length                  1B      length of the Line21 data for this VOBU         // max.120 = 60fields * 2B

        DCI_CCI (Display Control Information and Copy Control Information)
            DCI_CCI_SS                          1B      Status of DCI and CCI                           // same as DVD VR spec.
            DCI                                 1B      Display Control Inforamtion                     // same as DVD VR spec.
            CCI                                 1B      Copy Control Information                        // same as DVD VR spec.

        ES_ATRI (Elementary Stream Attribute Information)
            V_ATR                               2B      video_format(3b)/codec(3b)/resolution(3b)/bitrate(3b)/reserved(4b)
            A_ATR                               4B      codec(3b)/bitrate(5b)/channel(4b)/quantization(2b)// max.2 audio stream

        if ( Line21_data_length != 0 ){
            Line21_switch  ceil(Line21_data_length/8)B  valid/invalid flags of each Line21_data        // same as DVD-Video/VR spec.
            Line21_data          (Line21_data_length)B  Line21 data                                    // same as DVD-Video/VR spec.
            MNF_ID                                16B
            MNF_PRI                             13-145B  148 - ceil(Line21_data_length/8) - Line21_data_length
        }
        else{
            MNF_ID                                16B
            MNF_PRI                               148B
        }
    }
}
```

(*) Ceil() means round-up

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Fig.32

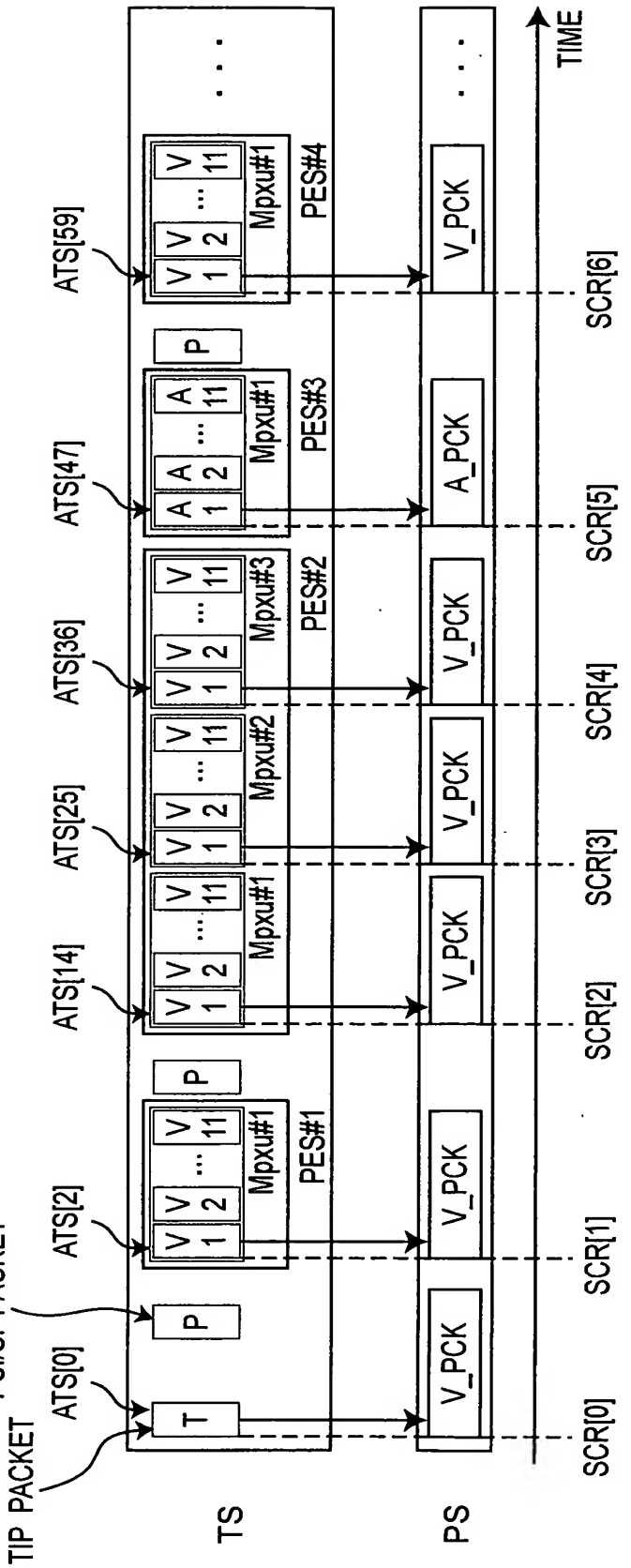
TIP PACKET
PSI/SI PACKET
ATS[0]
ATS[2]
ATS[14]
ATS[25]
ATS[36]
ATS[47]
ATS[59]
T
P
V 1 2 ... 11
A 1 2 ... 11
Mpxu#1
Mpxu#2
Mpxu#3
PES#1
PES#2
PES#3
PES#4
TS
PS
V_PCK
A_PCK
TIME
SCR[0]
SCR[1]
SCR[2]
SCR[3]
SCR[4]
SCR[5]
SCR[6]

Fig.33

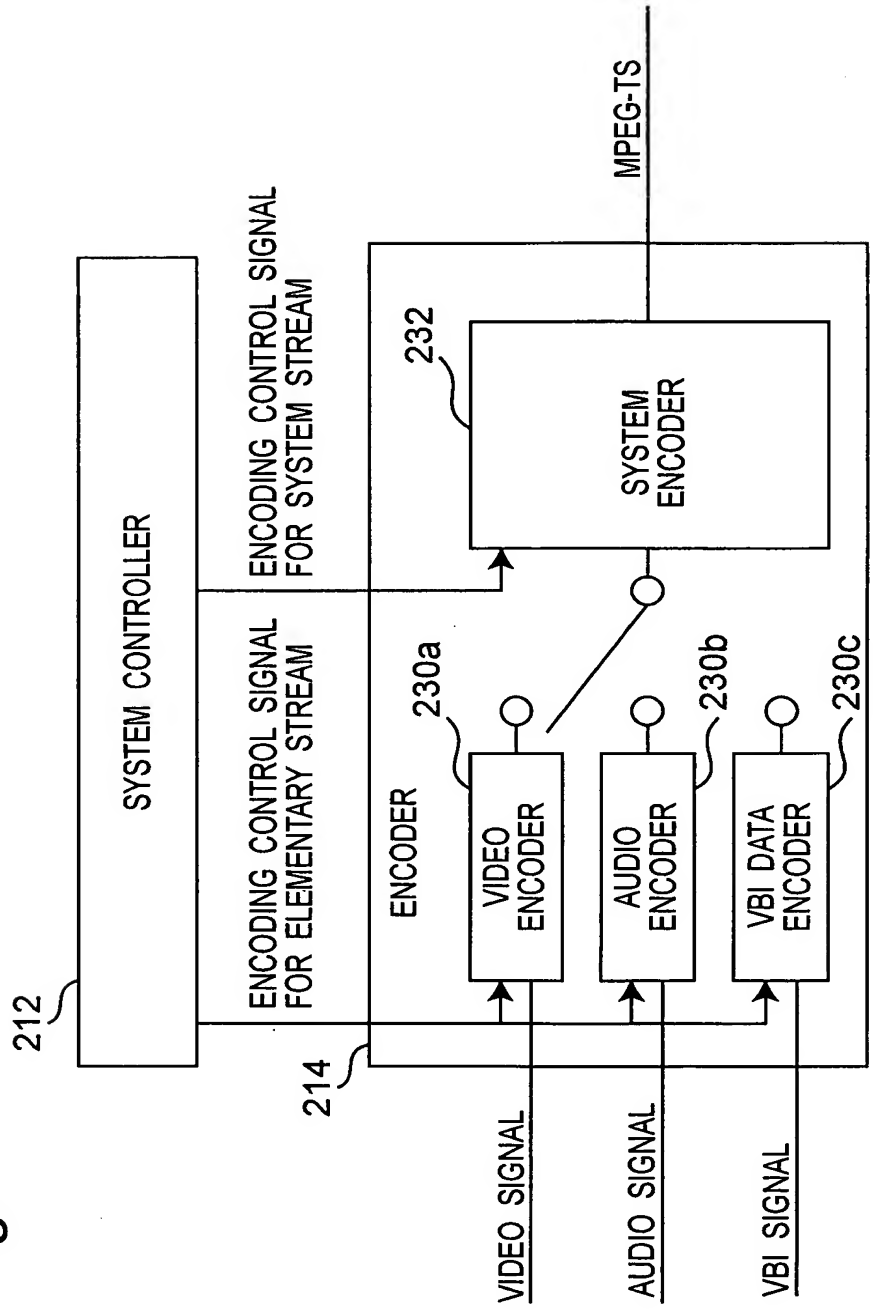
212
SYSTEM CONTROLLER
ENCODING CONTROL SIGNAL FOR ELEMENTARY STREAM
ENCODING CONTROL SIGNAL FOR SYSTEM STREAM
214
ENCODER
230a
VIDEO ENCODER
230b
AUDIO ENCODER
230c
VBI DATA ENCODER
232
SYSTEM ENCODER
MPEG-TS
VIDEO SIGNAL
AUDIO SIGNAL
VBI SIGNAL

Fig.34

CONVERSION FROM SELF-ENCODING MPEG-TS TO DVD-Video / DVD VR FORMAT		
	MPEG-TS ENCODED WITH NORMAL SYSTEM ENCODE (SESF)	MPEG-TS ENCODED WITH SYSTEM ENCODE CAPABLE OF EASY CONVERSION TO MPEG-TS (CONSTRAINED SESF)
WHEN ENCODED TO ELEMENTARY STREAM COMPATIBLE WITH DVD-Video	(CONVERSION TO DVD-Video) ELEMENTARY CAN BE USED AS IT IS. IN RE-ENCODING TO MPEG-PS, ELEMENTARY STREAM HAS TO BE ANALYZED. THE PROCESS IS COMPLICATED.	(CONVERSION TO DVD-Video) ELEMENTARY CAN BE USED AS IT IS. IN RE-ENCODING TO MPEG-PS, ELEMENTARY STREAM DO NOT HAVE TO BE ANALYZED, AND BUFFER MANAGEMENT IS ALSO NOT NEEDED.
WHEN ENCODED TO ELEMENTARY STREAM COMPATIBLE WITH DVD VR	(CONVERSION TO DVD VR) ELEMENTARY CAN BE USED AS IT IS. IN RE-ENCODING TO MPEG-PS, ELEMENTARY STREAM HAS TO BE ANALYZED. THE PROCESS IS COMPLICATED.	(CONVERSION TO DVD VR) ELEMENTARY CAN BE USED AS IT IS. IN RE-ENCODING TO MPEG-PS, ELEMENTARY STREAM DO NOT HAVE TO BE ANALYZED, AND BUFFER MANAGEMENT IS ALSO NOT NEEDED.

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Fig.35

Tip PACKET		
Syntax	No. of bits	Mnemonic
transport_packet(){		
sync_byte	8	bslbf
transport_error_indicator	1	bslbf
payload_unit_start_indicator	1	bslbf
transport_priority	1	bslbf
PID	13	uimsbf
transport_scrambling_control	2	bslbf
adaptation_filed_control	2	bslbf
continuity_counter	4	uimsbf
adaptation_field()		
Tip_Data(){		
Data_ID()	4 * 8	
display_and_copy_info()	8 * 8	
encode_info()	141 * 8	
MakersPrivateData()	41 * 8	
}		
}		

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Fig.36

adaptation_field()		
Syntax	No. of bits	Mnemonic
adaptation_field(){		
adaptation_field_length	8	uimsbf
discontinuity_indicator	1	bslbf
random_access_indicator	1	bslbf
elementary_stream_priority_indicator	1	bslbf
PCR_flag	1	bslbf
OPCR_flag	1	bslbf
splicing_point_flag	1	bslbf
transport_private_data_flag	1	bslbf
adaptation_field_extension_flag	1	bslbf
program_clock_reference_base	33	uimsbf
reserved	6	bslbf
program_clock_reference_extension	9	uimsbf
}		

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Fig.37

Data_ID()		
Syntax	No. of bits	Mnemonic
Data_ID (){		
Data_Identifier	24	uimsbf
reserved	8	bslbf
}		

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Fig.38

display_and_copy_info()		
Syntax	No. of bits	Value
display_and_copy_info (){		
reserved	40	bslbf
display_control_info_status	2	bslbf
reserved	2	bslbf
copy_control_info_status	3	bslbf
reserved	1	bslbf
Aspect ratio	4	bslbf
Subtitling mode	2	bslbf
reserved	1	bslbf
Film camera mode	1	bslbf
CGMS	2	bslbf
APSTB	2	bslbf
Source	1	bslbf
reserved	3	bslbf
}		

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Fig.39

encode_info()		
Syntax	No. of bits	Value
encode_info(){		
video_resolution	4	bslbf
reserved	2	bslbf
encode_condition	2	bslbf
reserved	8	bslbf
FVFPST	48	bslbf
reserved	8	bslbf
PES-info()	976(=8 * 122)	
}		

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Fig.40

PES_INFO(		
SYNTA	NO. OF BITS	VALU
PES_info(){		
for(j=0;j<136;j++){		
PES_existence_flag	1	bslbf
PES_payload_identifier	1	bslbf
If(PES_payload_identifier==0b){		
picture_coding_type	2	bslbf
}		
If(PES_payload_identifier==1b){		
stream_identifier	1	bslbf
sync_presentation_flag	1	bslbf
}		
}		
while(!bytealigned)		
zero_bit	1	bslbf
}		

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Fig.41

MakersPrivateData()		
Syntax	No. of bits	Value
MakersPrivateData(){		
maker_ID	16	uimsbf
maker_private_data	312(=39 * 8)	bslbf
}		

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Fig.42A

PID assignments	
PID value	meaning
0x1031	The PID of the transport packets which carry the Tip data stream

Fig.42B

stream_type assignments	
stream_type value	Description
0xC3	Tip data stream

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Fig.43

PES PACKET HEADER OF PES PACKET IN CONSTRAINED SESF	
fields	Permitted value in Constrained SESF
PES_packet_length	CONFOM TO ISO/IEC13818-1
PES_priority	0b
data_alignment_indicator	0b
copyright	0b
PTS_DTS_flags	00b,10b or 11b
ESCR_flag	0b
ES_rate_flag	0b
DSM_trick_mode_flag	0b
additional_copy_info_flag	0b
PES_CRC_flag	0b
PES_extension_flag	Reter to Fig.31
PES_header_data_length	Reter to Fig.31
PES_private_data_flag	0b, if exists
pack_header_field_flag	0b, if exists
program_packet_sequence_counter_flag	0b, if exists
P-STD_buffer_flag	0b, if exists
PES_extension_flag_2	0b, if exists
stuffing_byte	STUFFED FULLY WITH '0xFF'

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Fig.44

CONSTRAINT FOR PES_extension_flag AND PES_header_data_length					
PES packet		encode_condition=01b		encode_condition=11b	
STORED DATA	MVLTIPLEXED POSITION	VALUE OF PES_extension_flag AND PES_header_data_length	BYTE LENGTH OF stuffing_byte	VALUE OF PES_extension_flag AND PES_header_data_length	BYTE LENGTH OF stuffing_byte
MPEG2-Video, MPEG1-Audio	FIRST FOLLOWING TIP PACKET	PES_extension_flag=1b PES_header_data_length=VPD+3	2	PES_extension_flag=0b PES_header_data_length=VPD	0
	OTHERS	PES_extension_flag=0b PES_header_data_length=VPD	0		
AC-3 audio	FIRST FOLLOWING TIP PACKET	PES_extension_flag=1b PES_header_data_length=VPD+7	6	PES_extension_flag=0b PES_header_data_length=VPD+4	4
	OTHERS	PES_extension_flag=0b PES_header_data_length=VPD+4	4		

$$VPD=\begin{cases}0, & \text{(WHEN PTS_DTS_flags=00b)}\\ 5, & \text{(WHEN PTS_DTS_flags=01b)}\\ 10, & \text{(WHEN PTS_DTS_flags=11b)}\end{cases}$$

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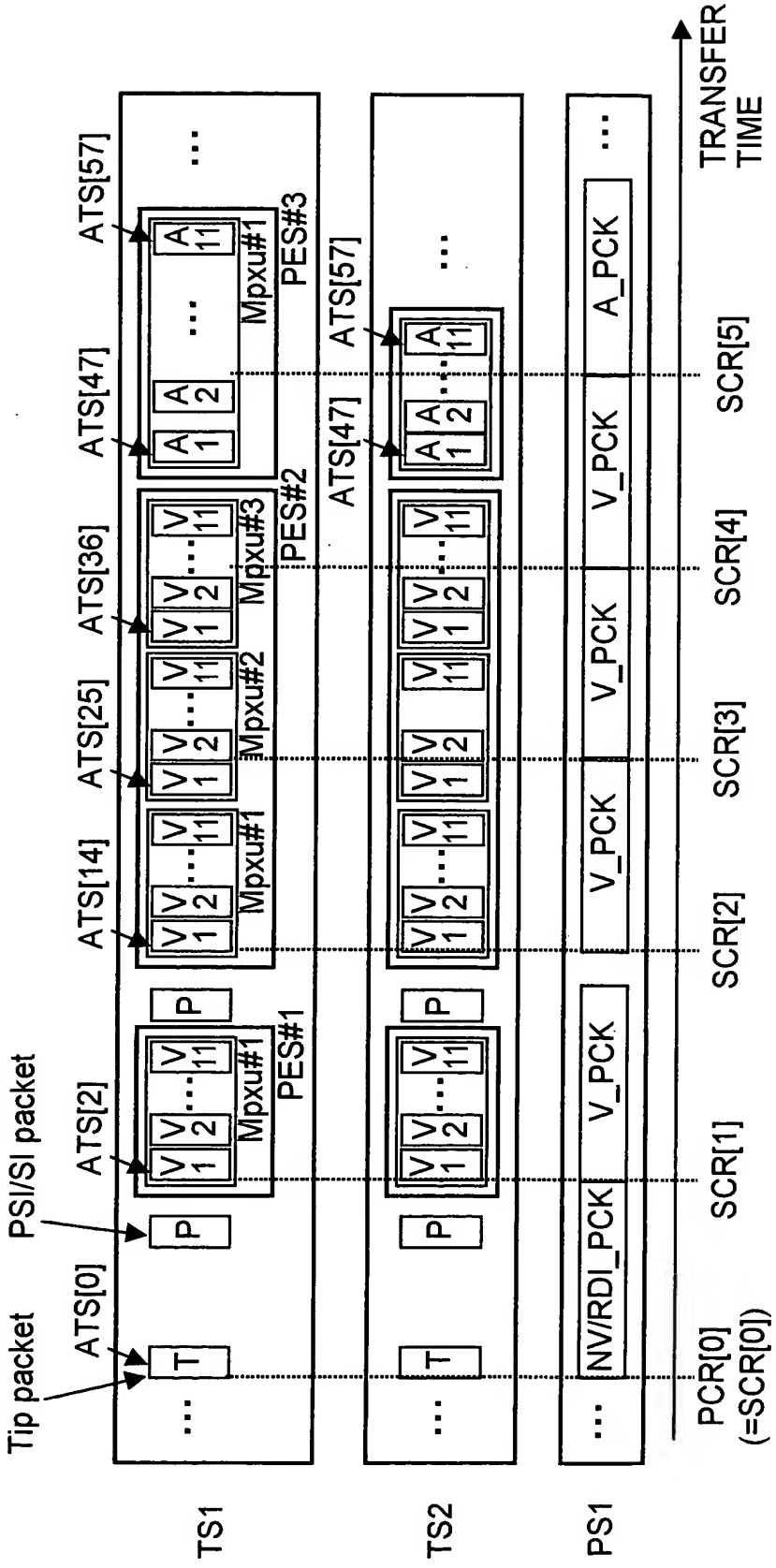
Fig.45


Tip packet
PSI/SI packet
ATS[0]
ATS[2]
ATS[14]
ATS[25]
ATS[36]
ATS[47]
ATS[57]
PES#1
PES#2
PES#3
Mpxu#1
Mpxu#2
Mpxu#3
TS1
TS2
PS1
V_PCK
A_PCK
NV/RDI_PCK
PCR[0]
(=SCR[0])
SCR[1]
SCR[2]
SCR[3]
SCR[4]
SCR[5]
TRANSFER
TIME

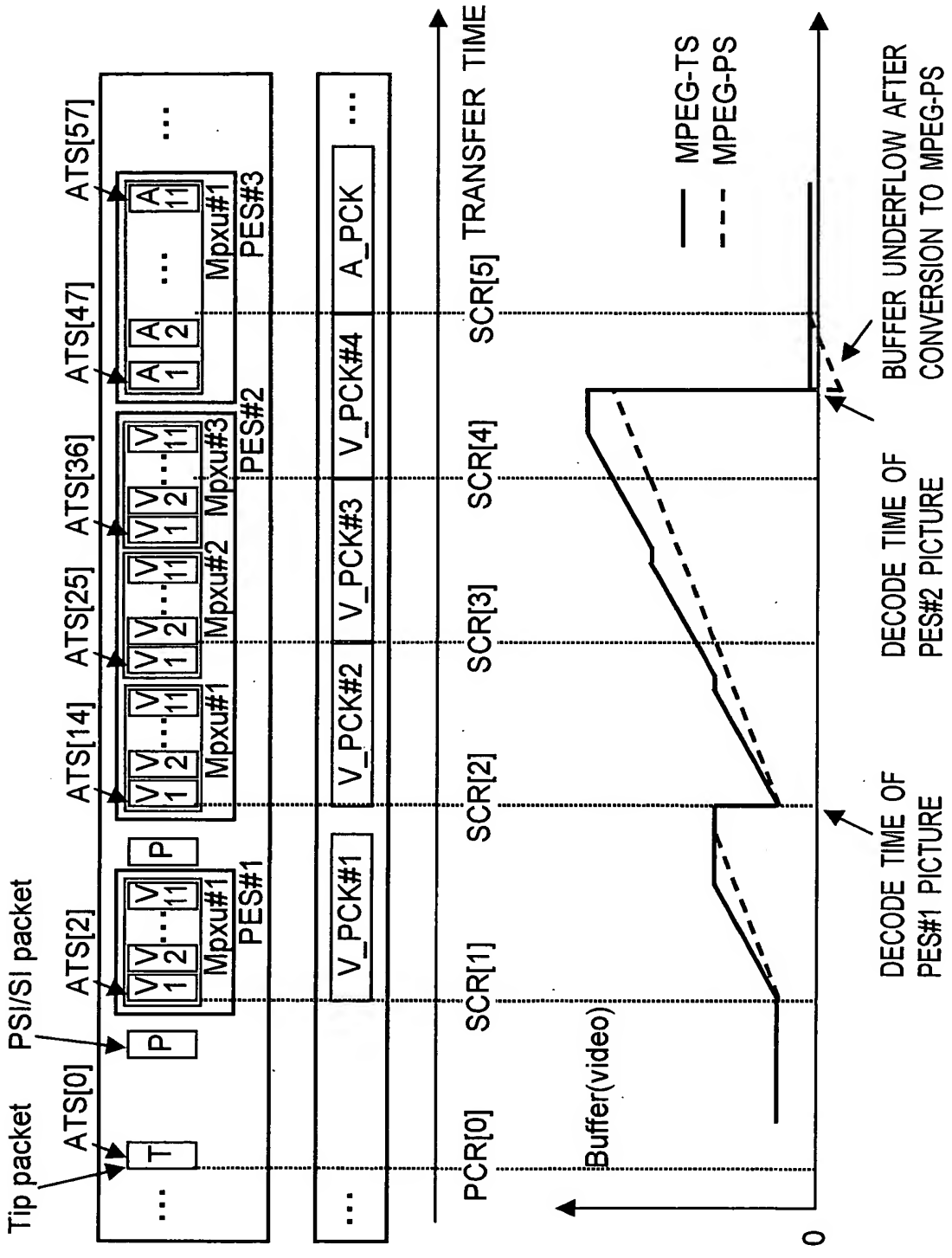


Fig.46A

Fig.46B

Fig.47

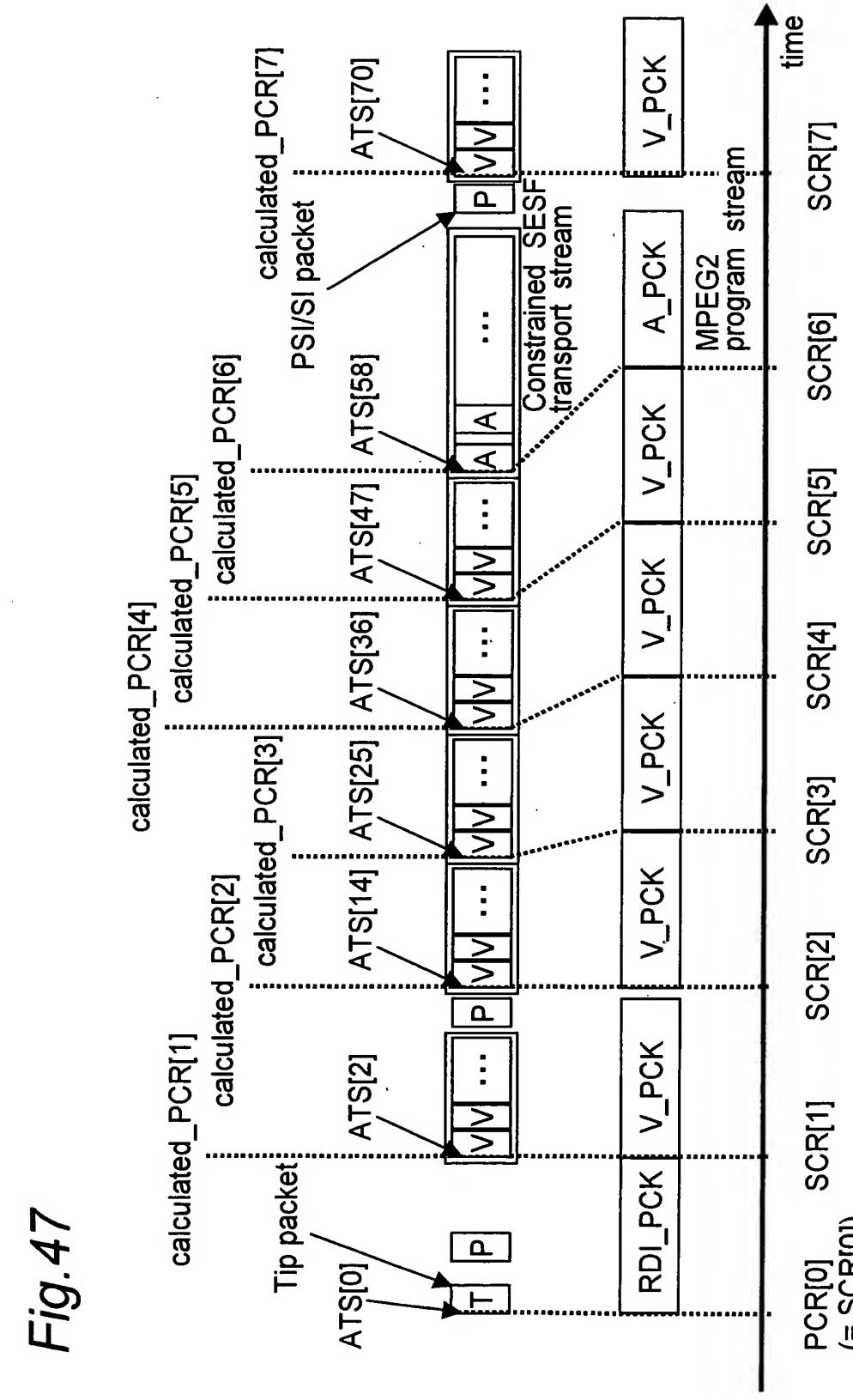

calculated_PCR[1]
calculated_PCR[2]
calculated_PCR[3]
calculated_PCR[4]
calculated_PCR[5]
calculated_PCR[6]
calculated_PCR[7]
Tip packet
PSI/SI packet
ATS[0]
ATS[2]
ATS[14]
ATS[25]
ATS[36]
ATS[47]
ATS[58]
ATS[70]
T
P
V
A
...
RDI_PCK
V_PCK
A_PCK
Constrained SESF transport stream
MPEG2 program stream
time
PCR[0] (= SCR[0])
SCR[1]
SCR[2]
SCR[3]
SCR[4]
SCR[5]
SCR[6]
SCR[7]

Fig.48

ATTRIBUTE OF ELEMENTARY STREAM FOR encode_condition=11b			
		NTSC	PAL
Video	Source picture resolution	720x480,704x480, 352x480,352x240 (*Note1)	720x576,704x576, 352x576,352x288 (*Note1)
	Aspect ratio	Display aspect ratio (*Note1) of 4:3 or 16:9	
	Bit rate	9.8Mbps (MAXIMUM)	
	GOP length	36 or less display fields	30 or less display field
	Sequence_end_code	once in end of VOB	
	Closed Captioning data	GOP layer user_data (same format as DVD VR) Picture layer (same format as ATSC)	N/A
	Teletext	N/A	Teletext transport packet (same format as DVB)
	WSS	(Tip transport packet)	Tip transport packet Picture layer user_data (SESF original formaT)
Audio	Quantization	16bits	
	Sampling frequency	48KHz	
	Bit rate	64-384Kbps for MPEG-1 Audio, 64-448Kbps for AC-3 (*Note1)	
	Number of audio channels	1-2ch for MPEG-1 Audio, 1-5.1ch for AC-3 (*Note1)	

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Fig.49

ATTRIBUTE OF ELEMENTARY STREAM FOR encode_condition=01b			
		NTSC	PAL
Video	Source picture resolution	720x480,704x480, 544x480,480x480, 352x480,352x240 (*Note2)	720x576,704x576, 544x576,480x576, 352x576,352x288 (*Note2)
	Aspect ratio	Display aspect ratio (*Note2) of 4:3 or 16:9	
	Bit rate	9.8Mbps (MAXIMUM)	
	GOP length	36 or less display fields	30 or less display fields
	Sequence_end_code	at least 90 display fields for sequence_end_code (*Note3)	at least 75 display fields for sequence_end_code (*Note3)
	Closed Captioning data	GOP layer user_data (same format as DVD VR) Picture layer (same format as ATSC)	N/A
	Teletext	N/A	Teletext transport packet (same format as DVB)
	WSS	(Tip transport packet)	Tip transport packet Picture layer user_data (SESF original format)
Audio	Quantization	16bits	
	Sampling frequency	48KHz	
	Bit rate	64-384Kbps for MPEG-1 Audio, 64-448Kbps for AC-3 (*Note1)	
	Number of audio channels	1-2ch and dual mono for MPEG-1 Audio, 1-5.1ch and dual mono for AC-3 (*Note4)	

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Fig. 50

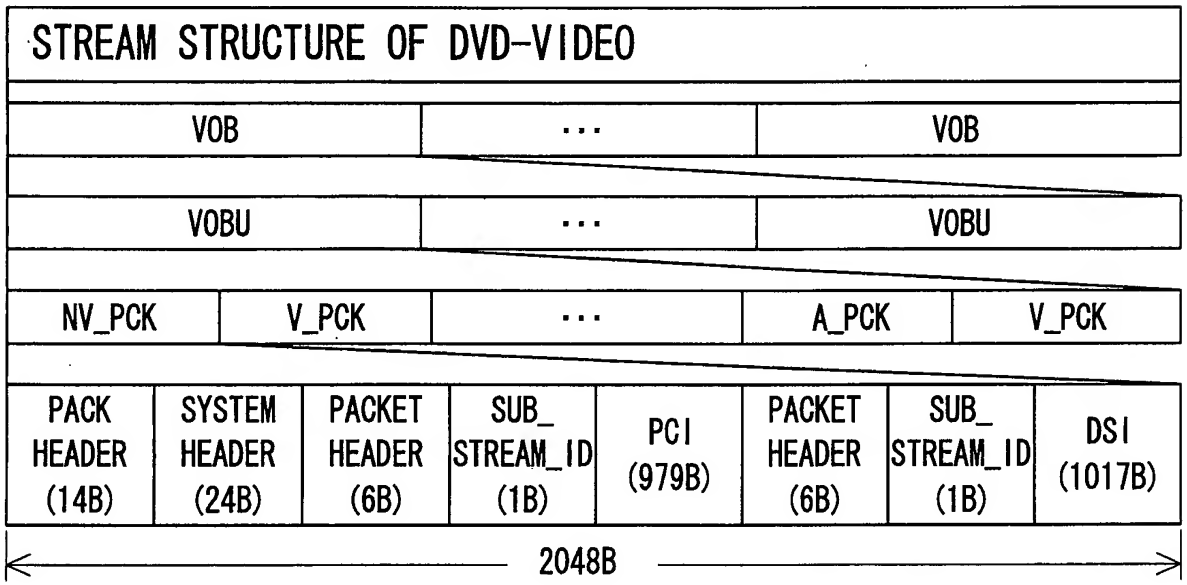

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Fig. 51

PCI OF NV_PCK		
SYNTAX	NO. OF BITS	MNEMONIC
PCI(){		
PCI_GI()	480(=8*60)	
NSML_AGLI()	288(=8*36)	
HLI()	5552(=8*694)	
RECI()	1512(=8*189)	
}		

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Fig. 52

PCI_GI OF NV_PCK		
SYNTAX	NO. OF BITS	MNEMONIC
PCI_GI(){		
NV_PCK_LBN	32	uimsbf
VOBU_CAT	16	bslbf
reserved	16	bslbf
VOBU_UOP_CTL	32	bslbf
VOBU_S_PTM	32	uimsbf
VOBU_E_PTM	32	uimsbf
VOBU_SE_E_PTM	32	uimsbf
C_ELTM	32	bslbf
reserved	256	bslbf
}		

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Fig. 53

DSI OF NV_PCK		
SYNTAX	NO. OF BITS	MNEMONIC
DSI(){		
DSI_GI()	256(=8*32)	
SML_PBI()	1184(=8*148)	
SML_AGLI()	432(=8*54)	
VOBU_SRI()	1344(=8*168)	
SYNCI()	1152(=8*144)	
reserved	3768(=8*471)	bslbf
}		

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Fig. 54

DSI_GI OF NV_PCK		
SYNTAX	NO. OF BITS	MNEMONIC
DSI_GI(){		
NV_PCK_SCR	32	uimsbf
NV_PCK_LBN	32	uimsbf
VOBU_EA	32	uimsbf
VOBU_1STREF_EA	32	uimsbf
VOBU_2NDREF_EA	32	uimsbf
VOBU_3RDREF_EA	32	uimsbf
VOBU_VOB_IDN	16	uimsbf
reserved	8	bslbf
VOBU_C_IDN	8	uimsbf
C_ELTM	32	bslbf
}		

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Fig. 55

SML_PBI OF NV_PCK		
SYNTAX	NO. OF BITS	MNEMONIC
PML_PBI(){		
VOBU_SML_CAT	16	bslbf
ILVU_EA	32	uimsbf
NXT_ILVU_SA	32	uimsbf
NXT_ILVU_SZ	16	uimsbf
VOB_V_S_PTM	32	uimsbf
VOB_V_E_PTM	32	uimsbf
VOB_A_STP_PTM	512(=8*64)	bslbf
VOB_A_GAP_LEN	512(=8*64)	bslbf
}		

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Fig. 56

SYNCI OF NV_PCK		
SYNTAX	NO. OF BITS	MNEMONIC
SYNCI(){		
A_SYNCA0	16	bslbf
:		
A_SYNCA7	16	bslbf
SP_SYNCA0	32	bslbf
:		
SP_SYNCA31	32	bslbf
}		

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Fig. 57

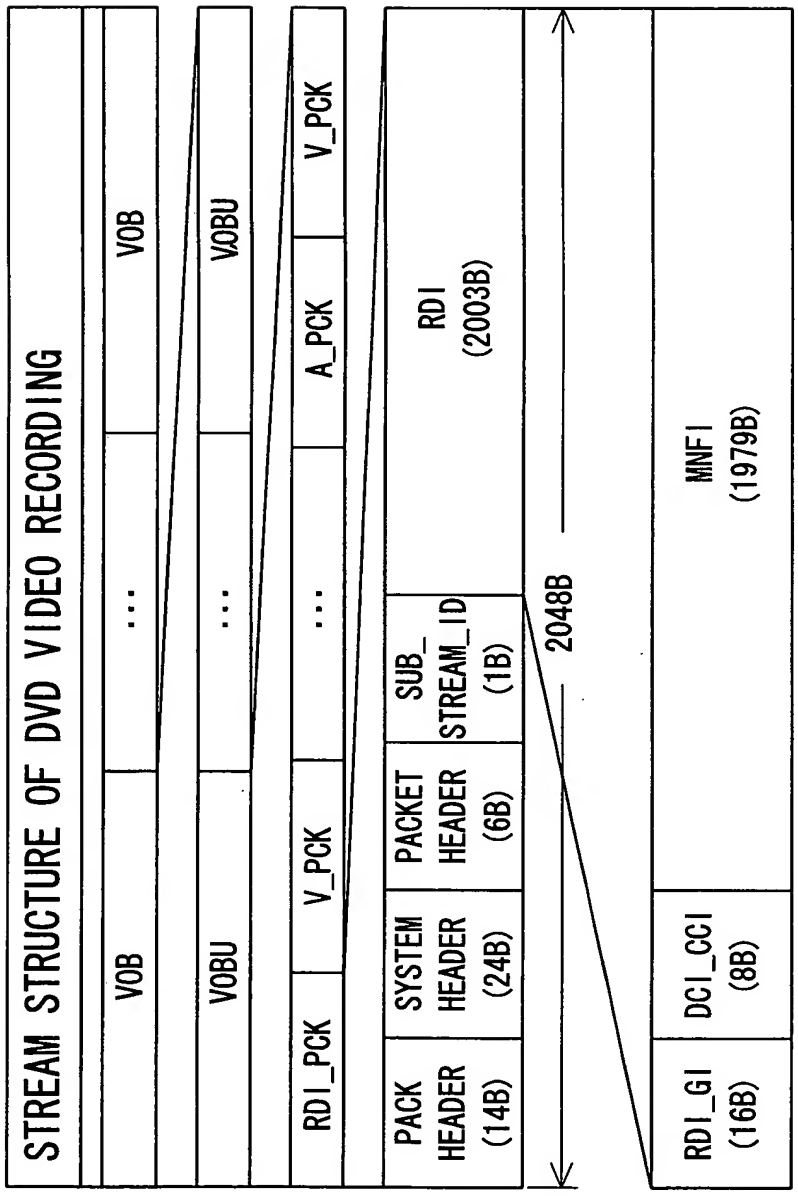
STREAM STRUCTURE OF DVD VIDEO RECORDING
VOB
VOBU
RDI_PCK
V_PCK
A_PCK
PACK HEADER (14B)
SYSTEM HEADER (24B)
PACKET HEADER (6B)
SUB_ STREAM_ID (1B)
RDI (2003B)
2048B
RDI_GI (16B)
DCI_CCI (8B)
MNFI (1979B)

Fig. 58

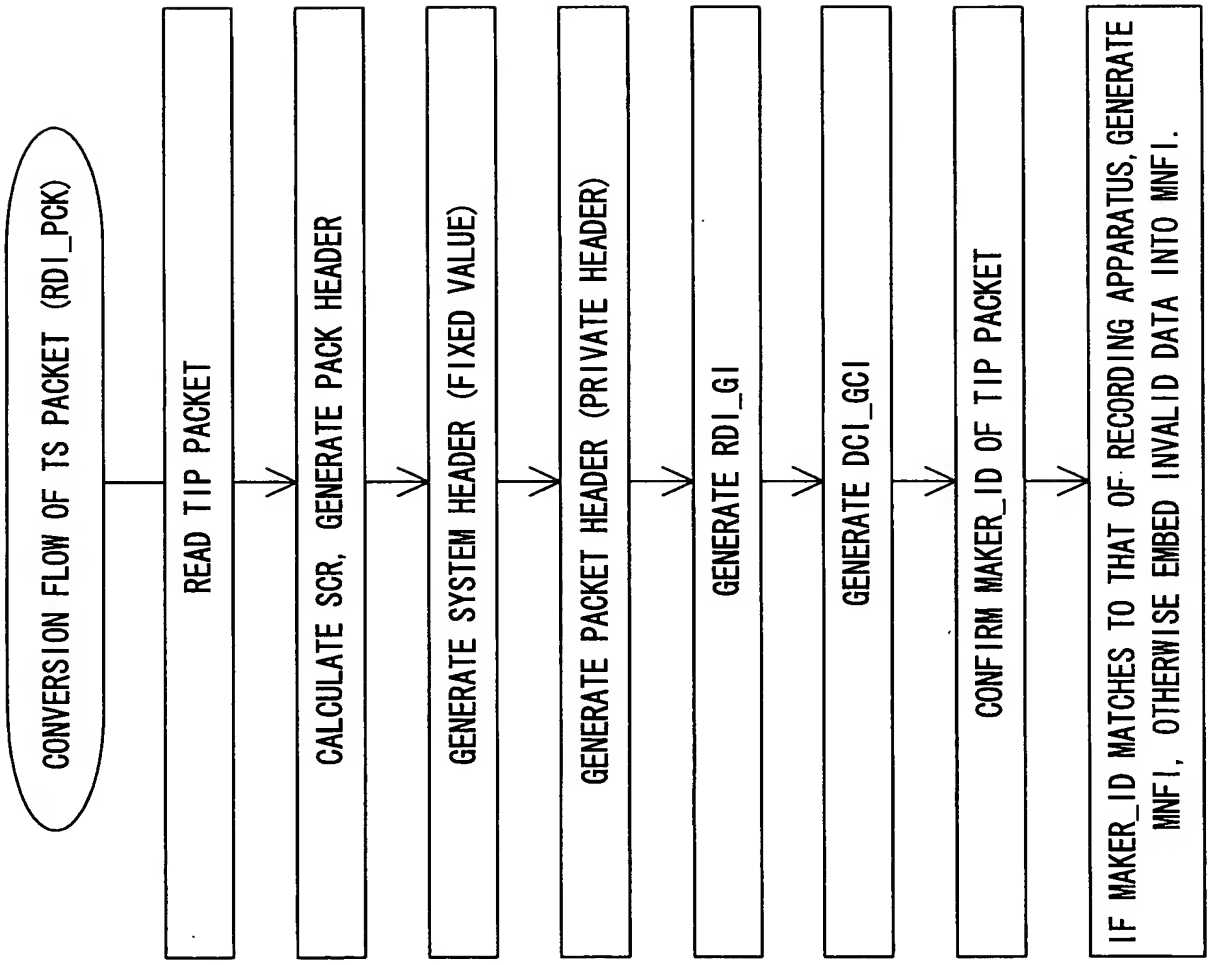
CONVERSION FLOW OF TS PACKET (RDI_PCK)
READ TIP PACKET
CALCULATE SCR, GENERATE PACK HEADER
GENERATE SYSTEM HEADER (FIXED VALUE)
GENERATE PACKET HEADER (PRIVATE HEADER)
GENERATE RDI_GI
GENERATE DCI_GCI
CONFIRM MAKER_ID OF TIP PACKET
IF MAKER_ID MATCHES TO THAT OF RECORDING APPARATUS, GENERATE MNFI, OTHERWISE EMBED INVALID DATA INTO MNFI.

Fig.59

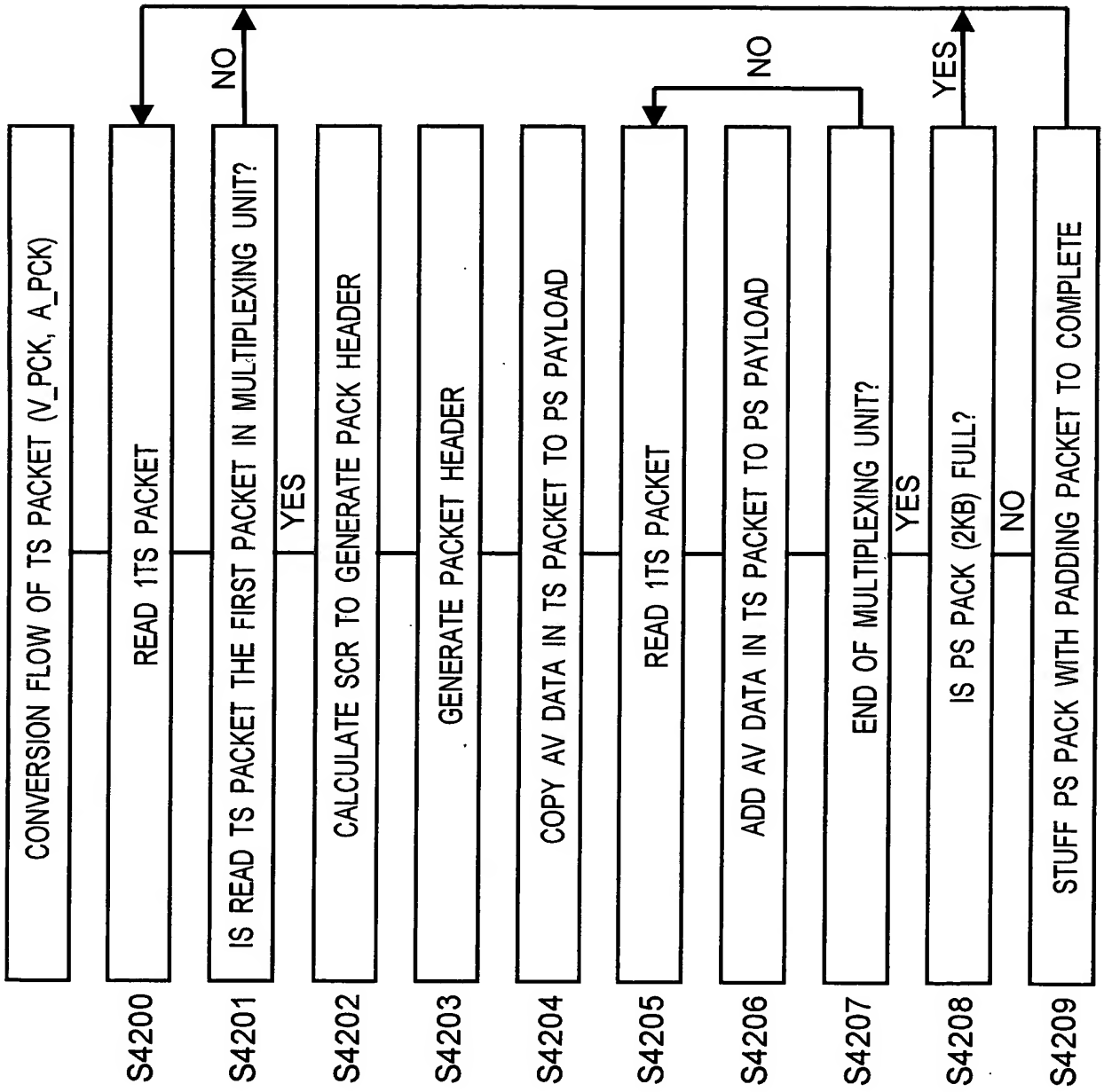
CONVERSION FLOW OF TS PACKET (V_PCK, A_PCK)
READ 1TS PACKET
IS READ TS PACKET THE FIRST PACKET IN MULTIPLEXING UNIT?
NO
YES
CALCULATE SCR TO GENERATE PACK HEADER
GENERATE PACKET HEADER
COPY AV DATA IN TS PACKET TO PS PAYLOAD
READ 1TS PACKET
NO
ADD AV DATA IN TS PACKET TO PS PAYLOAD
END OF MULTIPLEXING UNIT?
YES
IS PS PACK (2KB) FULL?
YES
NO
STUFF PS PACK WITH PADDING PACKET TO COMPLETE
S4200
S4201
S4202
S4203
S4204
S4205
S4206
S4207
S4208
S4209

Fig.60

PACK HEADER OF PACK IN MPEG2-PS		
Field	Number of bits	Permitted value
Pack_start_code	32	000001BAh
'01'	2	01b
SCR_base[32..30]	3	
marker_bit	1	1b
SCR_base[29..15]	15	
marker_bit	1	1b
SCR_base[14..0]	15	
marker_bit	1	1b
SCR_extension	9	
marker_bit	1	1b
program_mux_rate	22	6270h
marker_bit	1	1b
marker_bit	1	1b
reserved	5	11111b
pack_stuffing_length	3	000b

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Fig. 61

SYSTEM HEADER OF DVD FORMAT		
FIELD	NUMBER OF BITS	PERMITTED VALUE
system_header_start_code	32	000001BBh
header_length	16	18
marker_bit	1	1b
rate_bound	22	6270h
marker_bit	1	1b
audio_bound	6	0 to 2
fixed_flag	1	0b
CSPS_flag	1	Provider defined
system_audio_lock_flag	1	1b
system_video_lock_flag	1	1b
marker_bit	1	1b
video_bound	5	1
Packet_rate_restriction_flag	1	Provider defined
reserved_bits	7	7Fh
stream_id	8	B9h (all video streams)
'11'	2	11b
P-STD_buf_bound_scale	1	1b
P-STD_buf_size_bound	13	232
stream_id	8	B8h (all audio streams)
'11'	2	11b
P-STD_buf_bound_scale	1	0
P-STD_buf_size_bound	13	32
stream_id	8	BDh (private_stream_1)
'11'	2	11b
P-STD_buf_bound_scale	1	1b
P-STD_buf_size_bound	13	58
stream_id	8	BFh (private_stream_2)
'11'	2	11b
P-STD_buf_bound_scale	1	1b
P-STD_buf_size_bound	13	2

Fig. 62A

PACKET HEADER OF RDI_PCK		
FIELD	NUMBER OF BITS	PERMITTED VALUE
packet_strat_code_prefix	24	000001h
stream_id	8	BFh (private_stream_2)
PES_packet_legnth	16	07D4h

Fig. 62B

PRIVATE HEADER OF RDI_PCK		
FIELD	NUMBER OF BITS	PERMITTED VALUE
sub_stream_id	8	50h

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Fig.63

PACKET HEADER OF PACKET IN MPEG2-PS		
Field	Number of bits	Permitted value
PES_priority	1	0b
data_alignment_indicator	1	0b
copyright	1	0b
ESCR_flag	1	0b
ES_rate_flag	1	0b
DSM_trick_mode_flag	1	0b
additional_copy_info_flag	1	0b
PES_CRC_flag	1	0b
PES_extension_flag	1	same value as Constrained SESF
PES_header_data_length	8	same value as Constrained SESF
PES_private_data_flag	1	0b, if exists
pack_header_field_flag	1	0b, if exists
Program_packet_sequence_counter_flag	1	0b, if exists
P-STD_buffer_flag	1	1b, if exists
PES_extension_flag_2	1	0b, if exists
stuffing_byte	8*N	stuffed fully with '0×FF'

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Fig. 64

PRIVATE HEADER OF AC-3 IN DVD FORMAT		
FIELD	NUMBER OF BITS	PERMITTED VALUE
sub_stream_id	8	80h(primary) or 81h(secondary)
number_of_frame_headers	8	Provider defined
first_access_unit_pointer	16	0

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Fig.65A

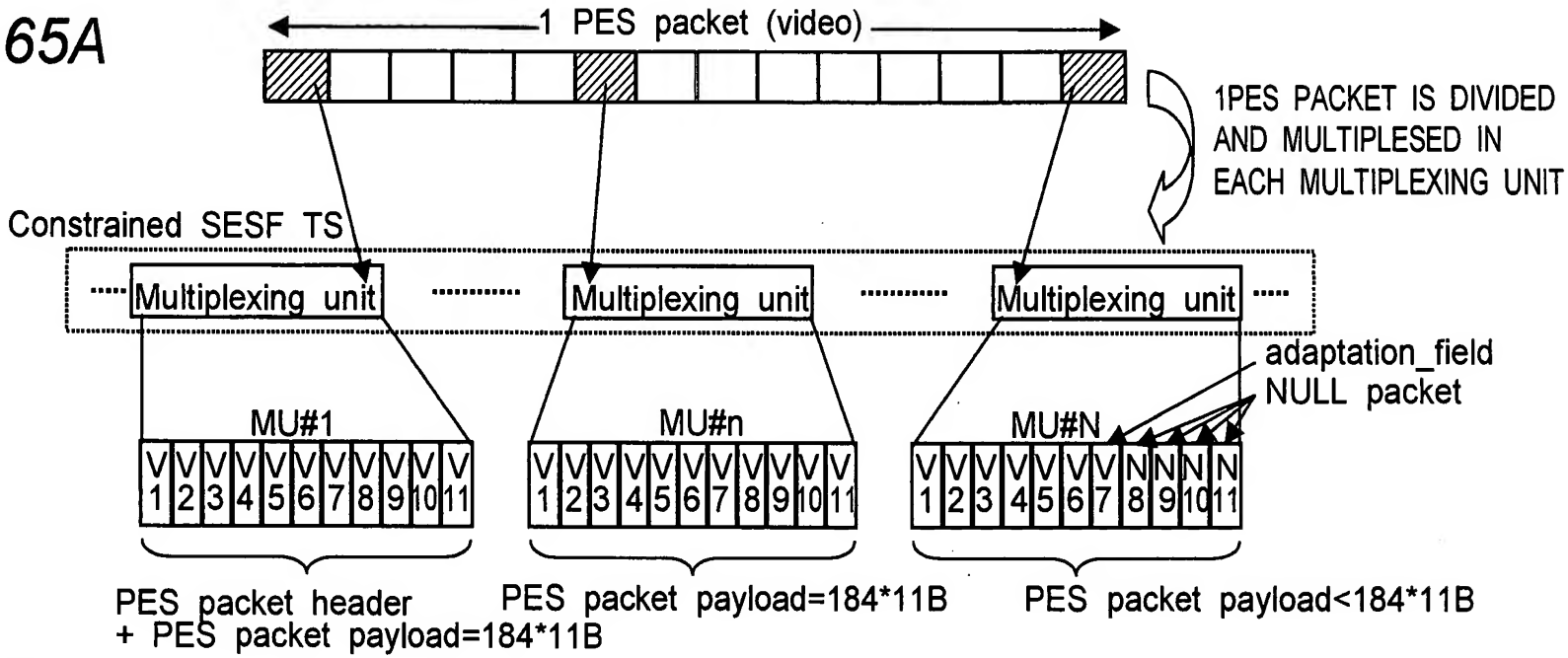

Fig.65B

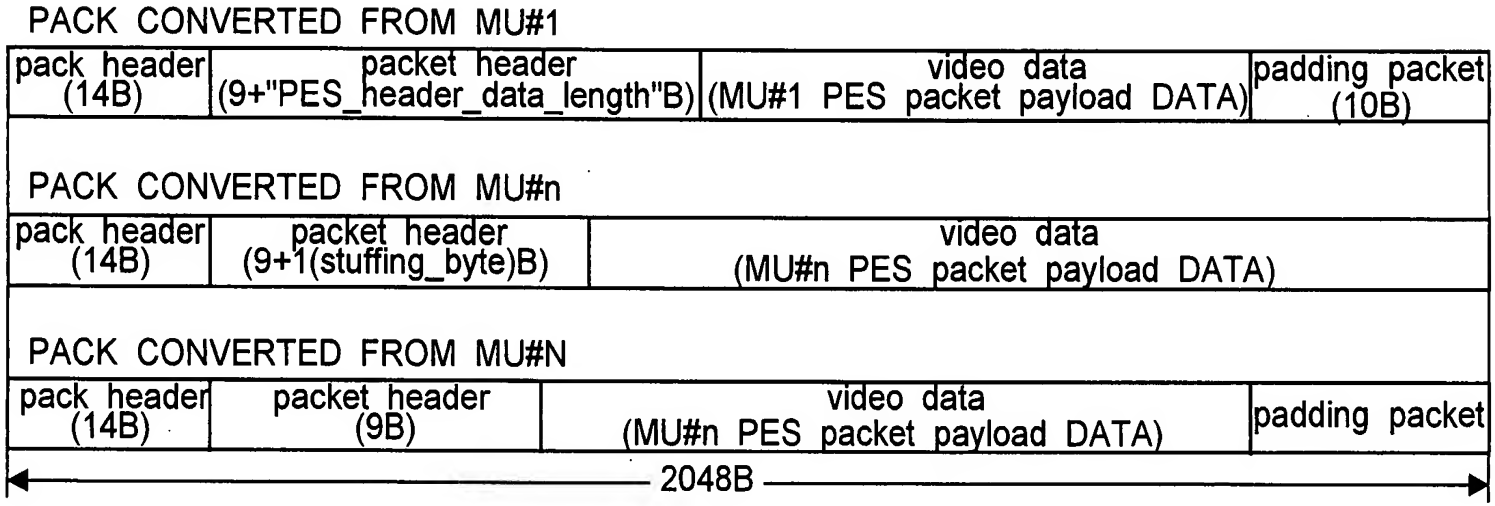

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Fig.66A

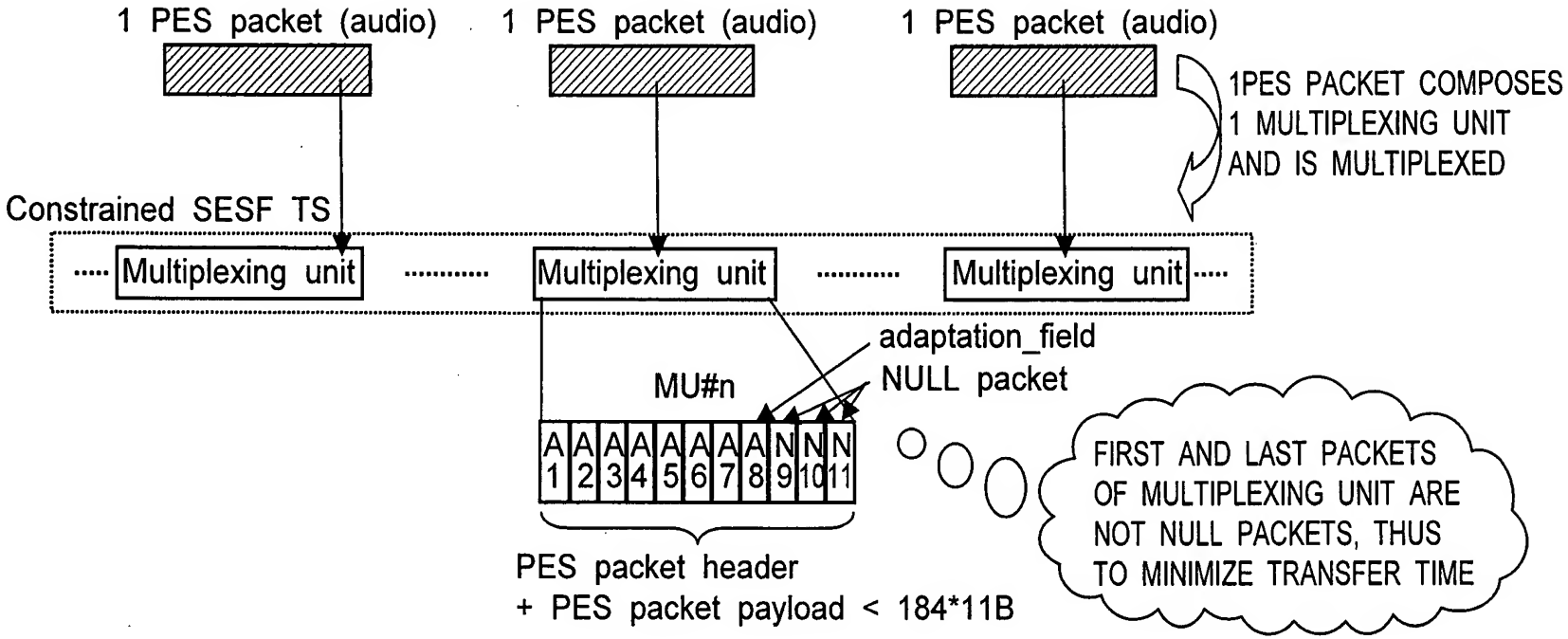

Fig.66B

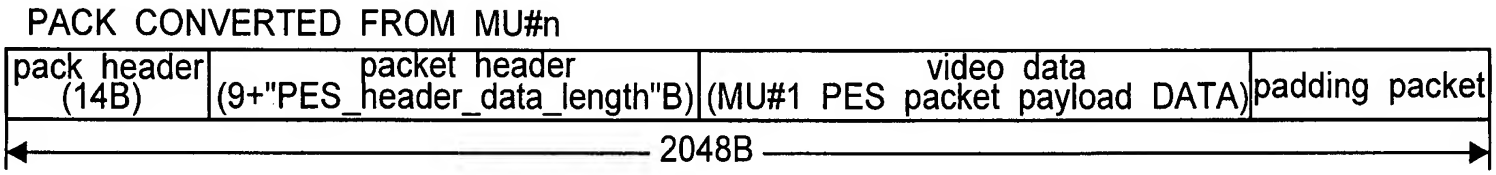

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Fig.67

BIT RATE ALLOWED IN Constrained SESF	MAXIMUM BYTE LENGTH OF PES PACKET PAYLOAD (AC-3 audio)	MAXIMUM BYTE LENGTH OF PES PACKET PAYLOAD (MPEG1-audio)
64 Kbps	1792	1920
80 Kbps	1920	1920
96 Kbps	1920	1728
112 Kbps	1792	1680
128 Kbps	1536	1920
160 Kbps	1920	1920
192 Kbps	1536	1728
224 Kbps	1792	1344
256 Kbps	1024	1536
320 Kbps	1280	1920
384 Kbps	1536	1152
448 Kbps	1792	N/A

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Fig.68

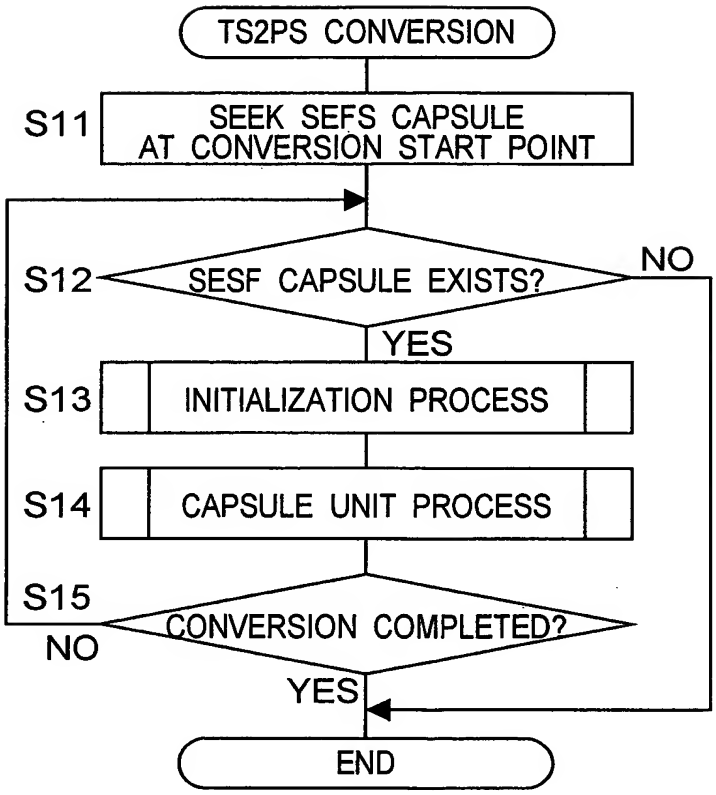
TS2PS CONVERSION
S11
SEEK SEFS CAPSULE AT CONVERSION START POINT
S12
SESF CAPSULE EXISTS?
NO
YES
S13
INITIALIZATION PROCESS
S14
CAPSULE UNIT PROCESS
S15
CONVERSION COMPLETED?
NO
YES
END

Fig.69

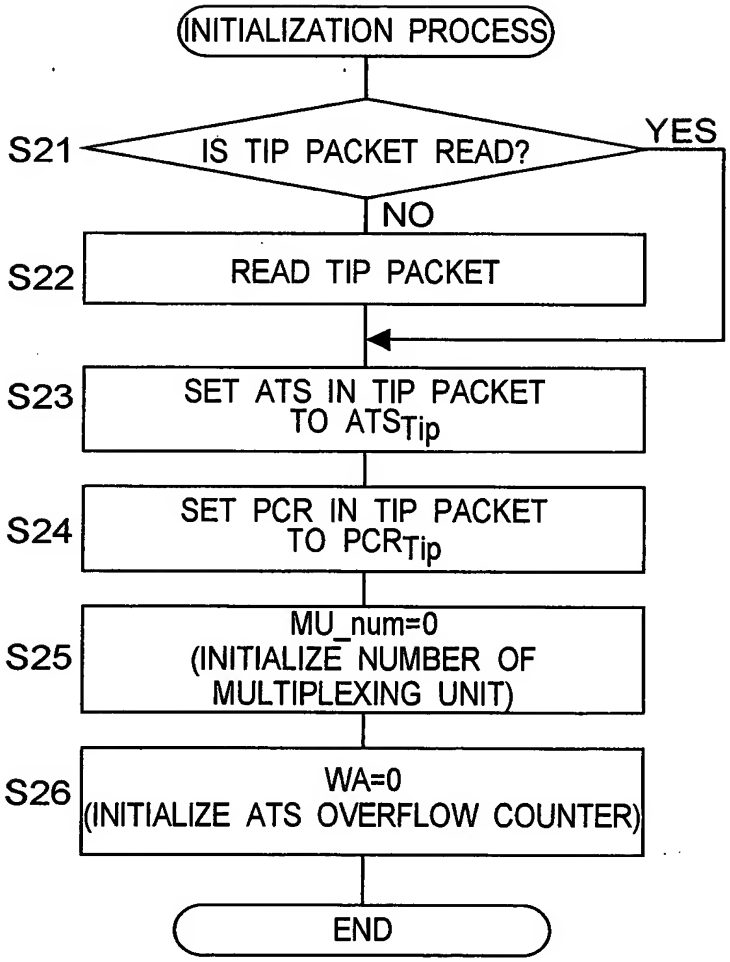
INITIALIZATION PROCESS
S21
IS TIP PACKET READ?
YES
NO
S22
READ TIP PACKET
S23
SET ATS IN TIP PACKET TO ATSTip
S24
SET PCR IN TIP PACKET TO PCRTip
S25
MU_num=0 (INITIALIZE NUMBER OF MULTIPLEXING UNIT)
S26
WA=0 (INITIALIZE ATS OVERFLOW COUNTER)
END

Fig.70

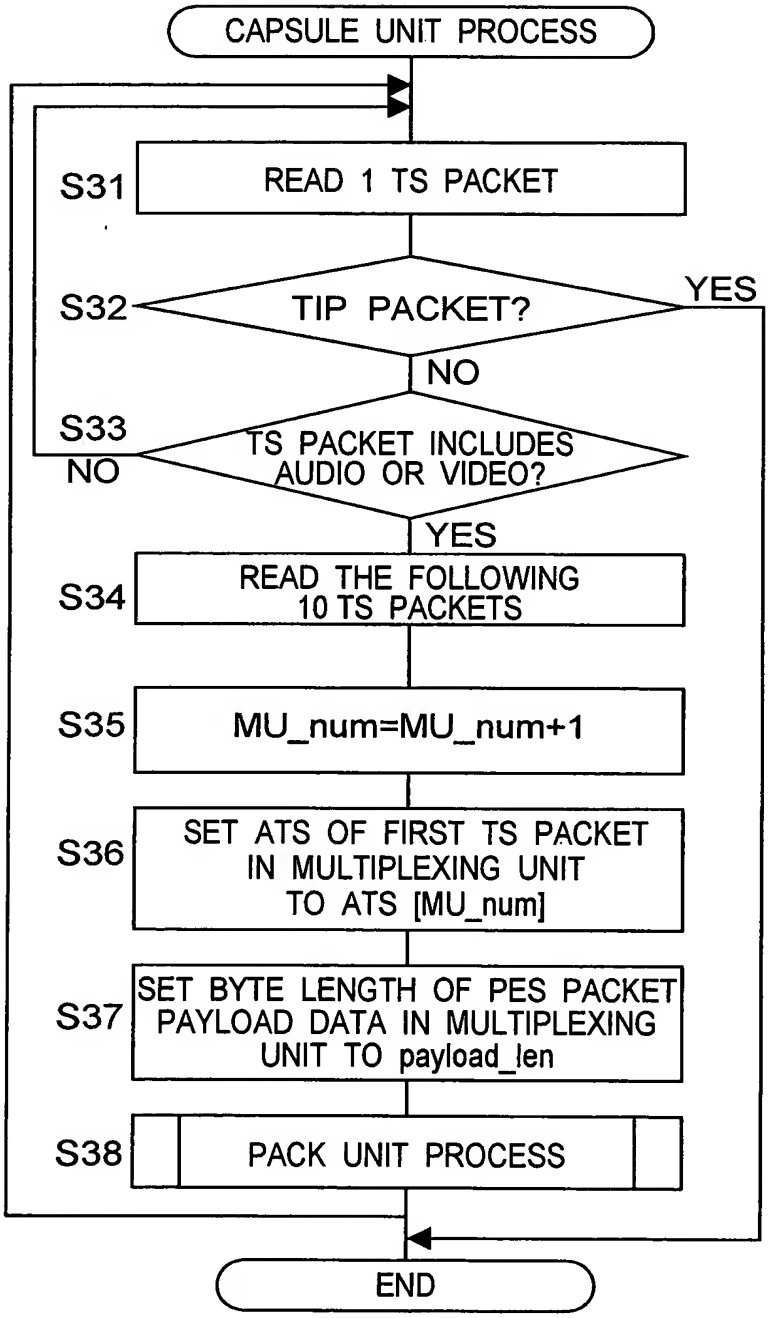
CAPSULE UNIT PROCESS
S31
READ 1 TS PACKET
S32
TIP PACKET?
YES
NO
S33
TS PACKET INCLUDES AUDIO OR VIDEO?
NO
YES
S34
READ THE FOLLOWING 10 TS PACKETS
S35
MU_num=MU_num+1
S36
SET ATS OF FIRST TS PACKET IN MULTIPLEXING UNIT TO ATS [MU_num]
S37
SET BYTE LENGTH OF PES PACKET PAYLOAD DATA IN MULTIPLEXING UNIT TO payload_len
S38
PACK UNIT PROCESS
END

Fig.71

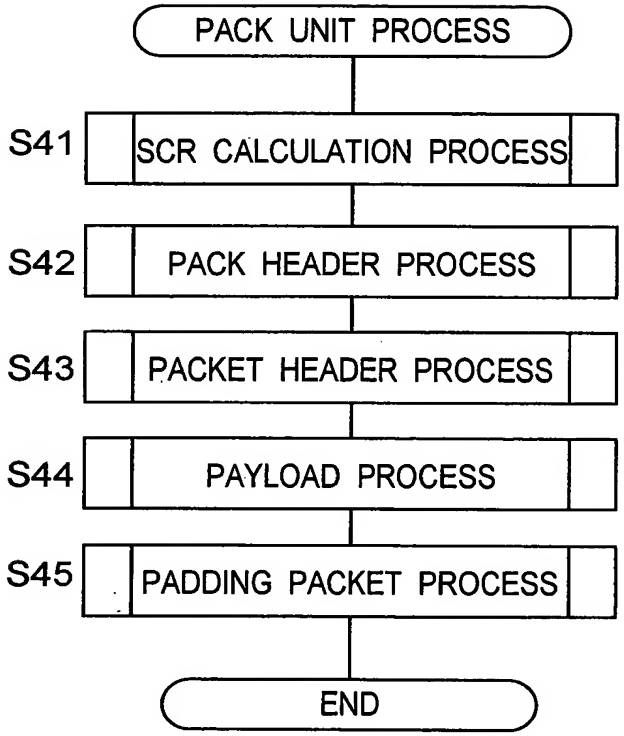
PACK UNIT PROCESS
S41
SCR CALCULATION PROCESS
S42
PACK HEADER PROCESS
S43
PACKET HEADER PROCESS
S44
PAYLOAD PROCESS
S45
PADDING PACKET PROCESS
END

Fig. 72

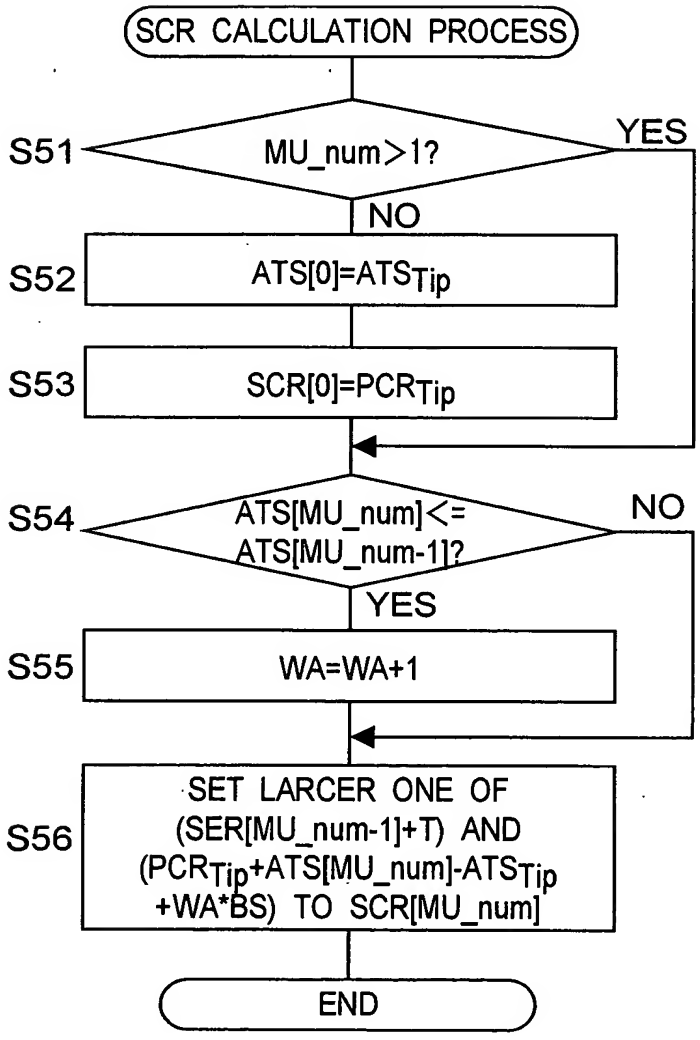
SCR CALCULATION PROCESS
S51
MU_num>1?
YES
NO
S52
ATS[0]=ATSTip
S53
SCR[0]=PCRTip
S54
ATS[MU_num]<=
ATS[MU_num-1]?
NO
YES
S55
WA=WA+1
S56
SET LARCER ONE OF
(SER[MU_num-1]+T) AND
(PCRTip+ATS[MU_num]-ATSTip
+WA*BS) TO SCR[MU_num]
END

Fig.73

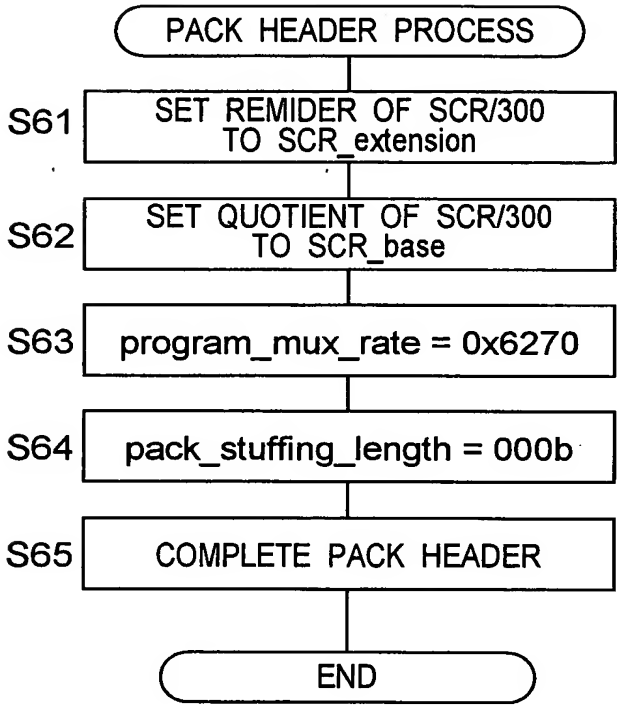
PACK HEADER PROCESS
S61
SET REMIDER OF SCR/300 TO SCR_extension
S62
SET QUOTIENT OF SCR/300 TO SCR_base
S63
program_mux_rate = 0x6270
S64
pack_stuffing_length = 000b
S65
COMPLETE PACK HEADER
END

Fig.74

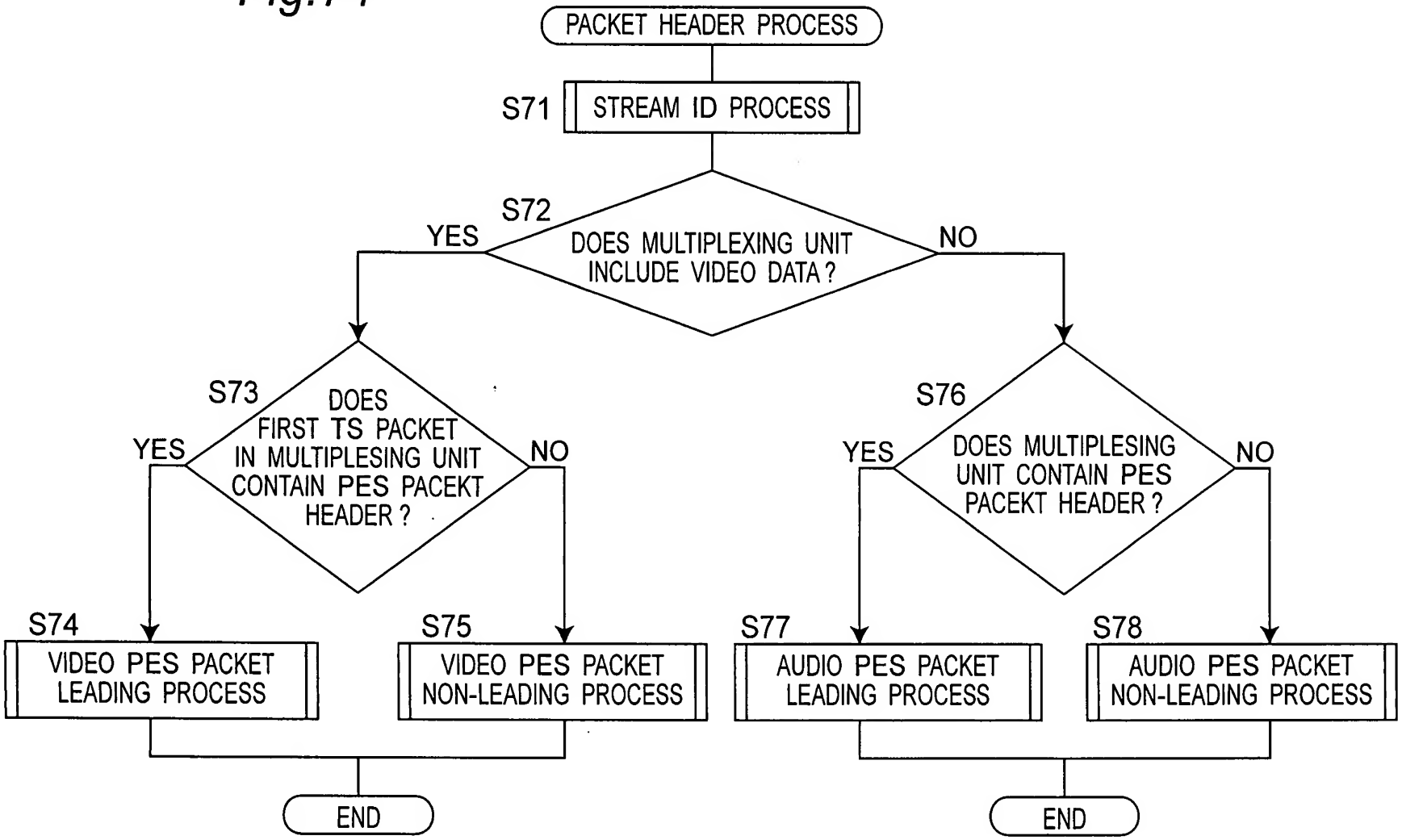

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Fig.75

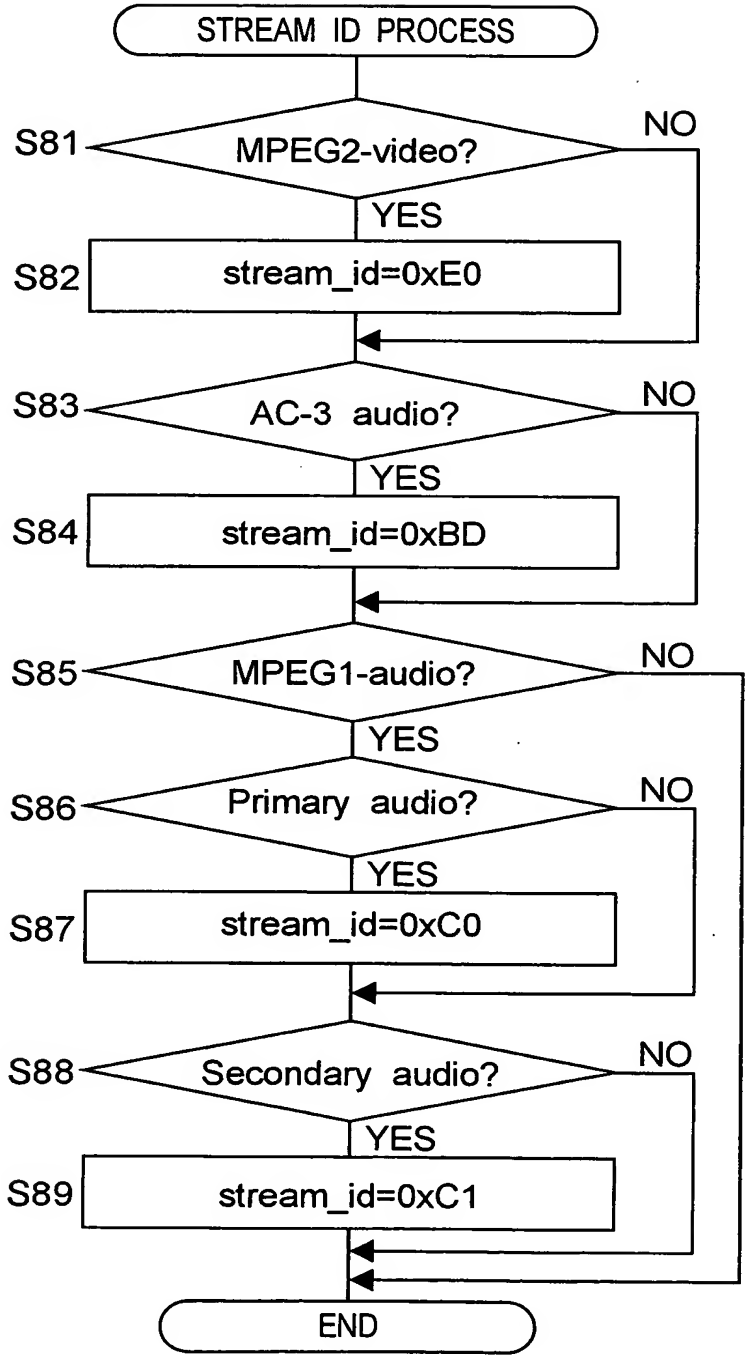
STREAM ID PROCESS
S81
MPEG2-video?
NO
YES
S82
stream_id=0xE0
S83
AC-3 audio?
NO
YES
S84
stream_id=0xBD
S85
MPEG1-audio?
NO
YES
S86
Primary audio?
NO
YES
S87
stream_id=0xC0
S88
Secondary audio?
NO
YES
S89
stream_id=0xC1
END

Fig.76A

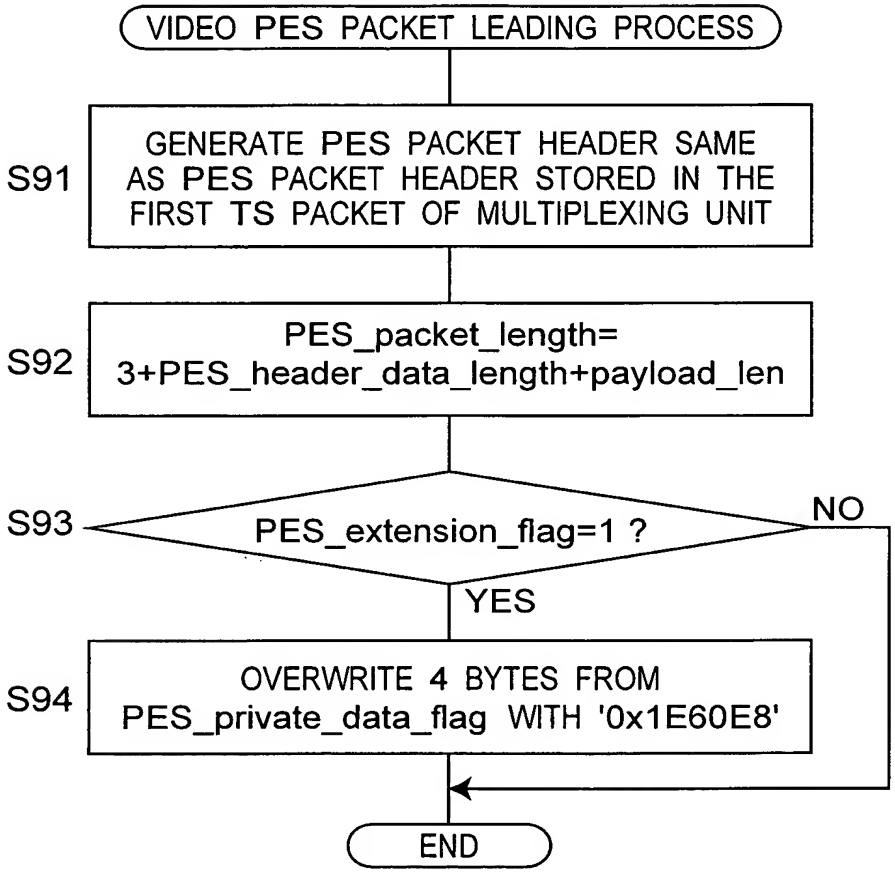
VIDEO PES PACKET LEADING PROCESS
S91
GENERATE PES PACKET HEADER SAME AS PES PACKET HEADER STORED IN THE FIRST TS PACKET OF MULTIPLEXING UNIT
S92
PES_packet_length= 3+PES_header_data_length+payload_len
S93
PES_extension_flag=1 ?
NO
YES
S94
OVERWRITE 4 BYTES FROM PES_private_data_flag WITH '0x1E60E8'
END

Fig.76B

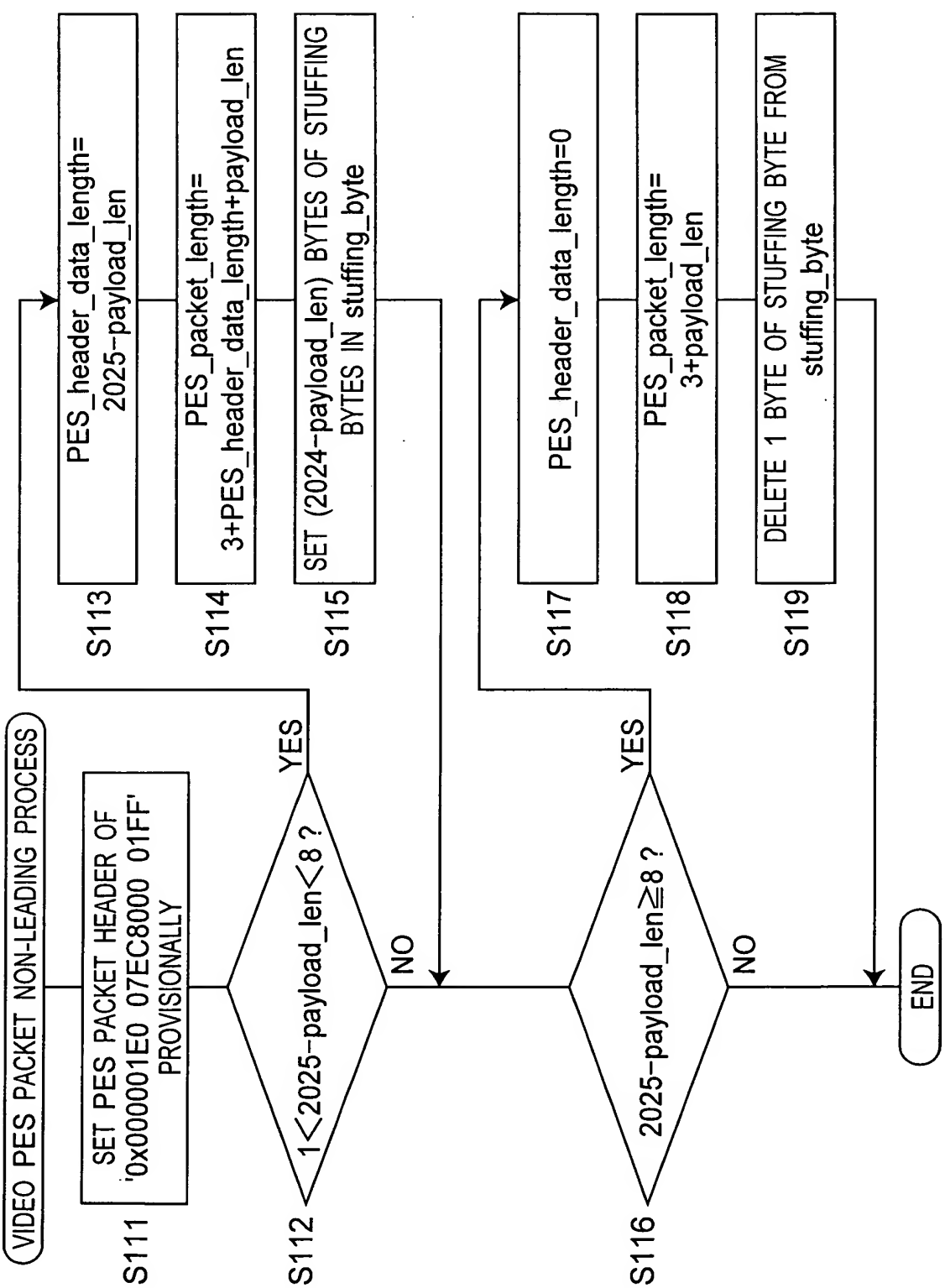
VIDEO PES PACKET NON-LEADING PROCESS
S111
SET PES PACKET HEADER OF '0x000001E0 07EC8000 01FF' PROVISIONALLY
S112
1<2025−payload_len<8 ?
YES
NO
S113
PES_header_data_length= 2025−payload_len
S114
PES_packet_length= 3+PES_header_data_length+payload_len
S115
SET (2024−payload_len) BYTES OF STUFFING BYTES IN stuffing_byte
S116
2025−payload_len≧8 ?
YES
NO
S117
PES_header_data_length=0
S118
PES_packet_length= 3+payload_len
S119
DELETE 1 BYTE OF STUFFING BYTE FROM stuffing_byte
END

Fig.77A

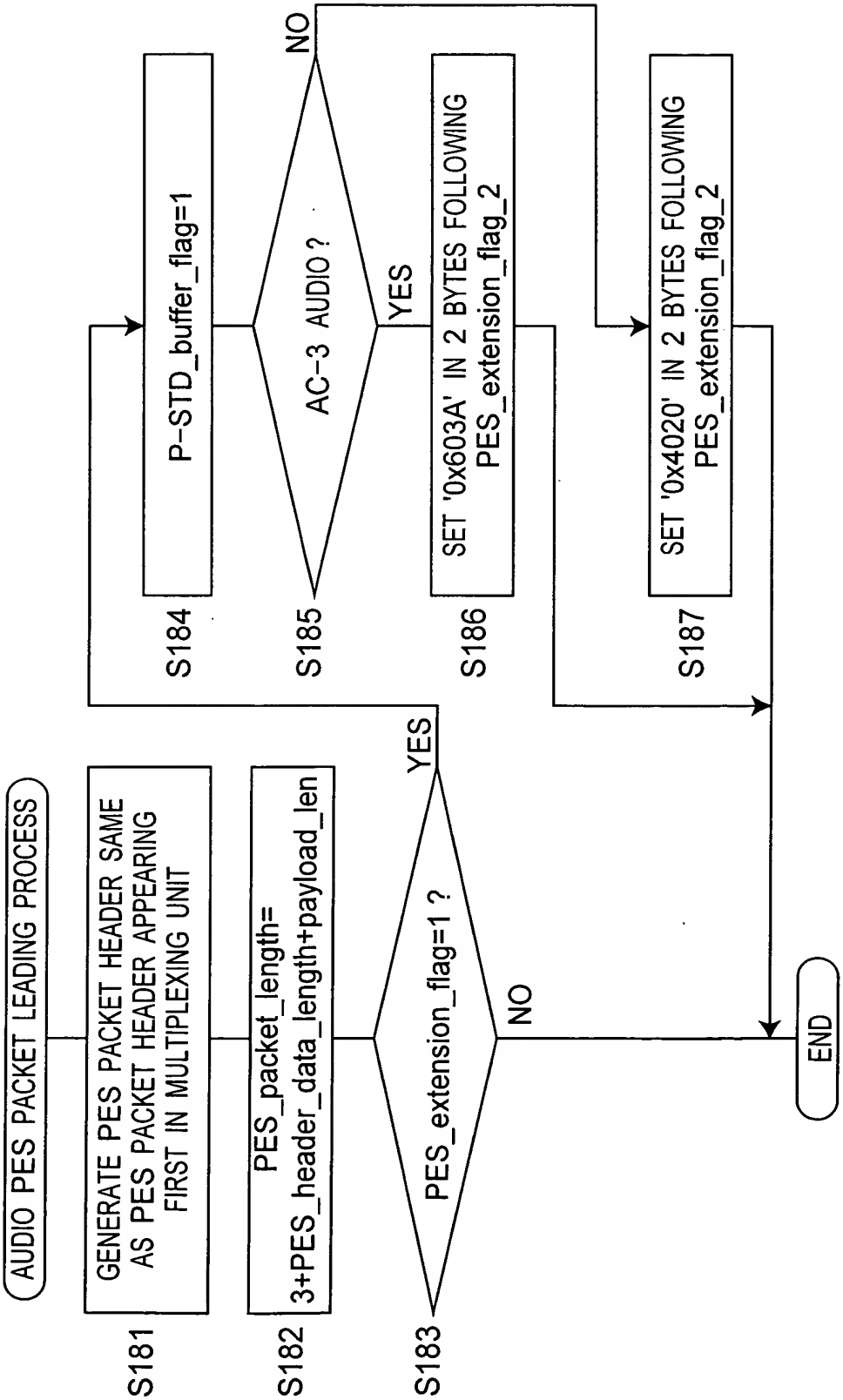
AUDIO PES PACKET LEADING PROCESS
GENERATE PES PACKET HEADER SAME AS PES PACKET HEADER APPEARING FIRST IN MULTIPLEXING UNIT
S181
PES_packet_length= 3+PES_header_data_length+payload_len
S182
PES_extension_flag=1 ?
S183
YES
NO
P-STD_buffer_flag=1
S184
AC-3 AUDIO ?
S185
NO
YES
SET '0x603A' IN 2 BYTES FOLLOWING PES_extension_flag_2
S186
SET '0x4020' IN 2 BYTES FOLLOWING PES_extension_flag_2
S187
END

Fig.77B

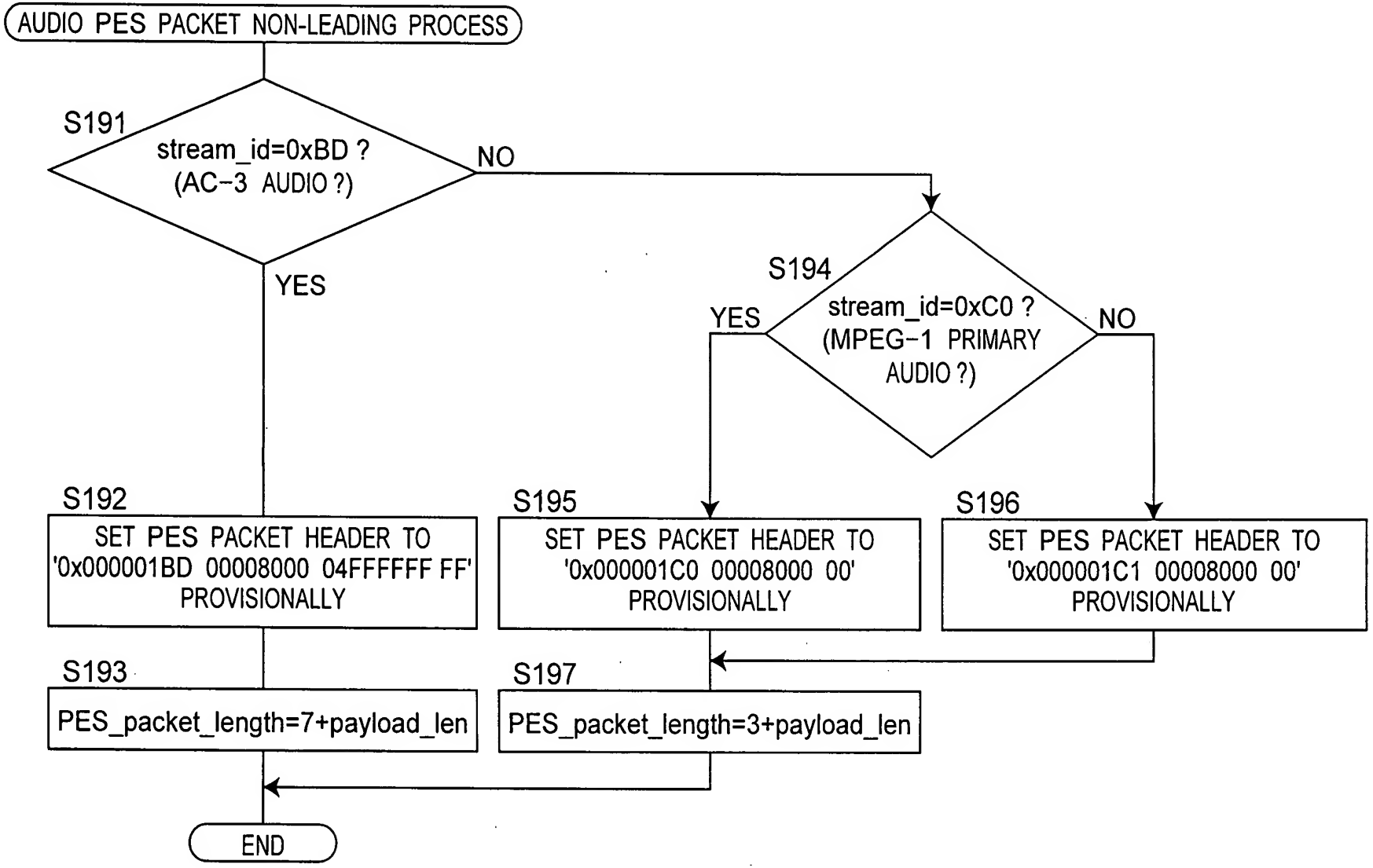

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Fig.78

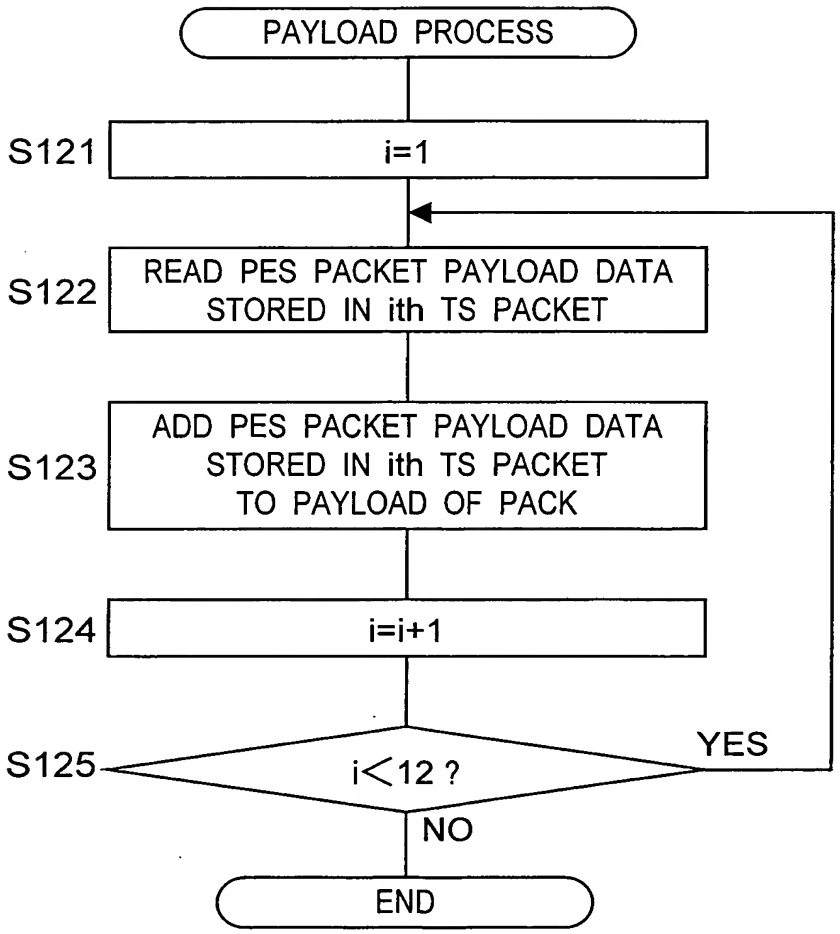
PAYLOAD PROCESS
S121
i=1
S122
READ PES PACKET PAYLOAD DATA STORED IN ith TS PACKET
S123
ADD PES PACKET PAYLOAD DATA STORED IN ith TS PACKET TO PAYLOAD OF PACK
S124
i=i+1
S125
i<12 ?
YES
NO
END

Fig.79

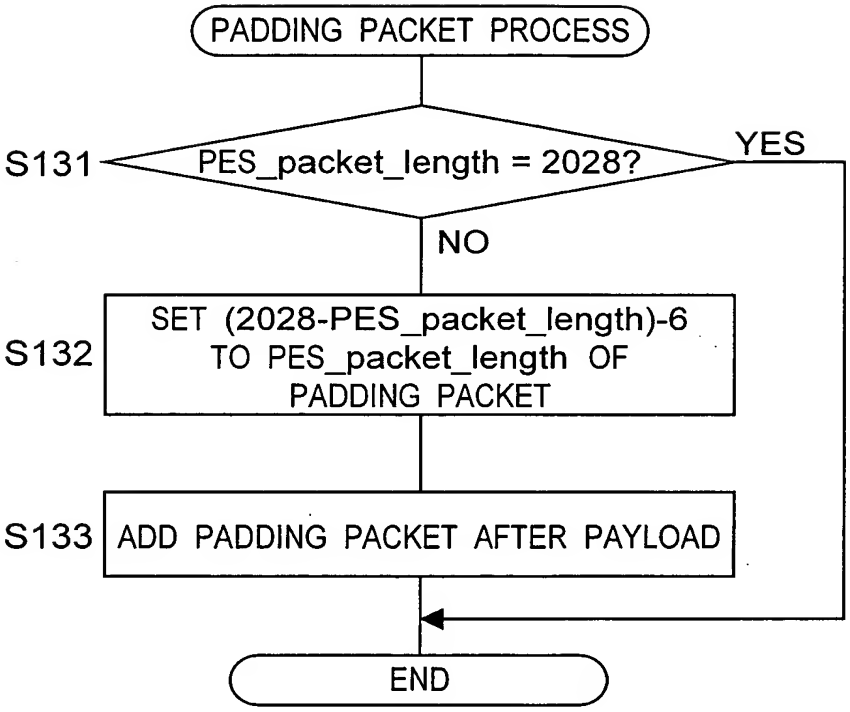
PADDING PACKET PROCESS
S131
PES_packet_length = 2028?
YES
NO
S132
SET (2028-PES_packet_length)-6 TO PES_packet_length OF PADDING PACKET
S133
ADD PADDING PACKET AFTER PAYLOAD
END

Fig.80

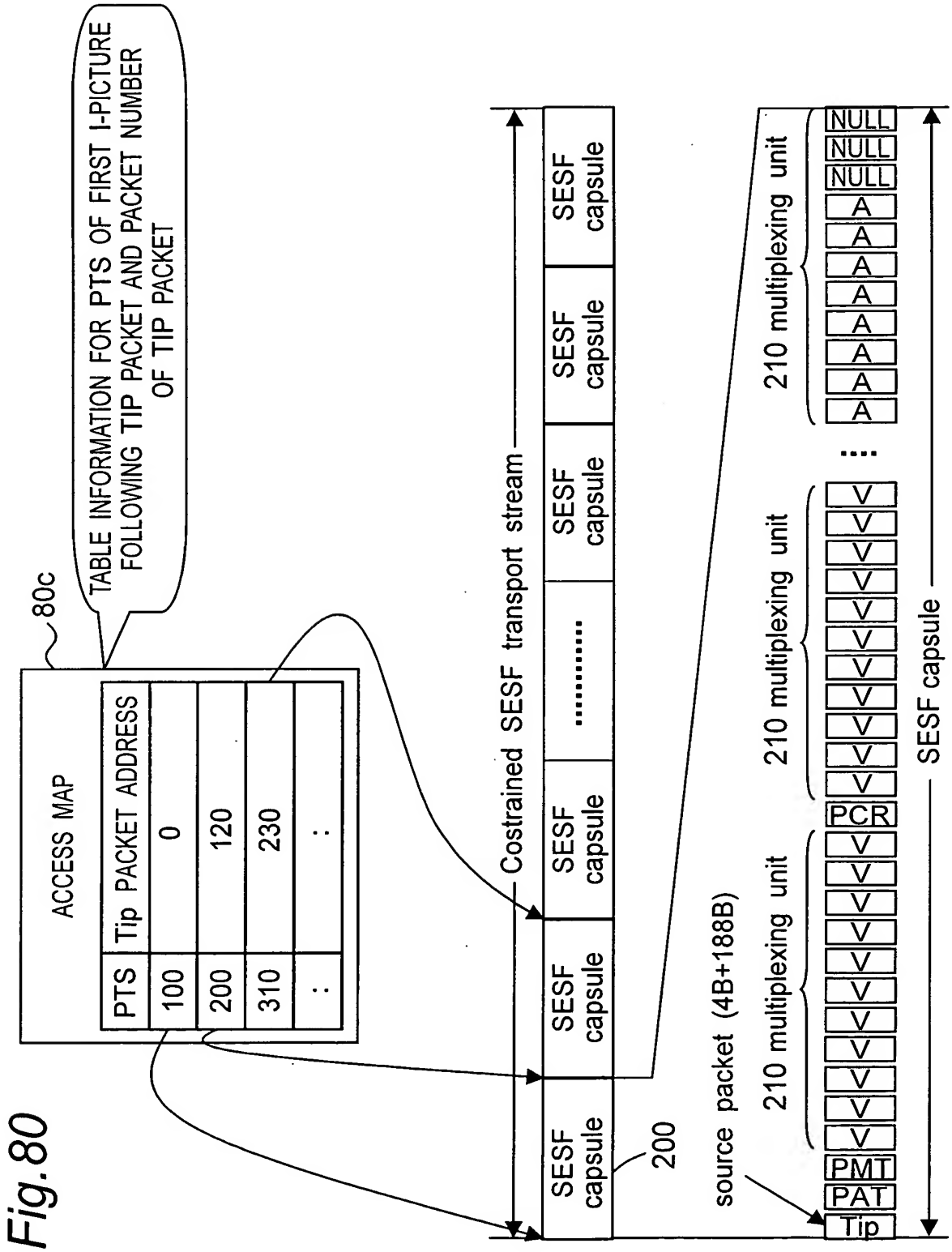
80c
ACCESS MAP
TABLE INFORMATION FOR PTS OF FIRST I-PICTURE FOLLOWING TIP PACKET AND PACKET NUMBER OF TIP PACKET
PTS
Tip PACKET ADDRESS
100
0
200
120
310
230
Costrained SESF transport stream
SESF capsule
200
source packet (4B+188B)
210 multiplexing unit
NULL
A
V
PCR
PMT
PAT
Tip
SESF capsule

Fig.81

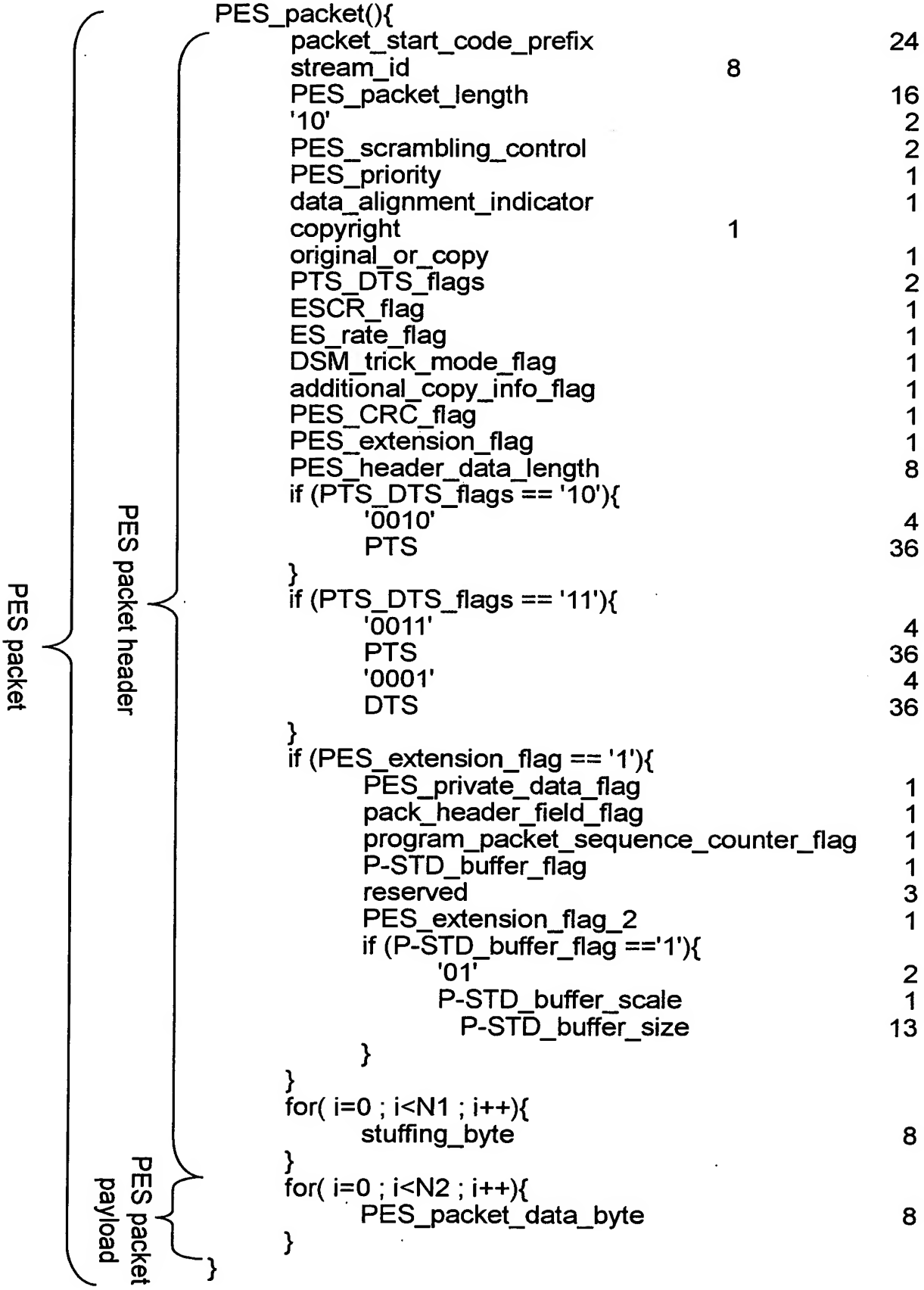
PES_packet(){
packet_start_code_prefix 24
stream_id 8
PES_packet_length 16
'10' 2
PES_scrambling_control 2
PES_priority 1
data_alignment_indicator 1
copyright 1
original_or_copy 1
PTS_DTS_flags 2
ESCR_flag 1
ES_rate_flag 1
DSM_trick_mode_flag 1
additional_copy_info_flag 1
PES_CRC_flag 1
PES_extension_flag 1
PES_header_data_length 8
if (PTS_DTS_flags == '10'){
'0010' 4
PTS 36
}
if (PTS_DTS_flags == '11'){
'0011' 4
PTS 36
'0001' 4
DTS 36
}
if (PES_extension_flag == '1'){
PES_private_data_flag 1
pack_header_field_flag 1
program_packet_sequence_counter_flag 1
P-STD_buffer_flag 1
reserved 3
PES_extension_flag_2 1
if (P-STD_buffer_flag =='1'){
'01' 2
P-STD_buffer_scale 1
P-STD_buffer_size 13
}
}
for(i=0 ; i<N1 ; i++){
stuffing_byte 8
}
for(i=0 ; i<N2 ; i++){
PES_packet_data_byte 8
}
}
PES packet
PES packet header
PES packet payload

Fig.82

CALCULATION OF INTERNAL DATA OF NV_PCK		
	FIELD	CALCULATION METHOD
Pack header	SC	CALCULATE FROM ATS AND PCR OF Tip PACKET, AND ATS OF A HEAD Tip PACKET IN Multiplexing unit.
PCI data	NV_PCK_LBN	COUNT PACKS CONVERTED IN THE CONVERSION.
	VOBU_S_PTM	CALCULATE FROM FVFPST OF Tip PACKET.
	VOBU_E_PTM	CALCULATE FROM FVFPST OF NEXT Tip PACKET. ONLY FOR THE LAST NV_PCK, THE VALUE IS EQUAL TO VOB_V_E_PTM.
	VOBU_SE_E_PTM	EXCEPT FOR THE LAST NV_PCK, 0x00 IS FILLED. FOR THE LAST NV_PCK, THE VALUE IS EQUAL TO VOB_V_E_PTM.
	C_ELTM	CALCULATE FROM VOBU_S_PTM OF A HEAD VOBU IN CELL AND VOBU_S_PTM OF THE VOBU
DSI data	NV_PCK_SCR	ASSIGN SCR OF NV_PCK TO THIS FILED
	NV_PCK_LBN	SAME TO PCI data
	VOBU_EA	COUNT DURING TS2PS TO ASSIGN, OR CALCULATION FROM ACCESS MAP
	VOBU_1STREF_EA	COUNT PACKS UNTIL THE LAST PACK OF THE FIRST PES PACKET AFTER TS2PS CONVERSION OF WHICH picture_coding_type IS 01b OR 10b OF Tip PACKET, AND ASSIGN THE COUNT TO THIS FIELD.
	VOBU_2NDREF_EA	COUNT PACKS UNTIL THE LAST PACK OF SECOND PES PACKET AFTER TS2PS CONVERSION OF WHICH picture_coding_type IS 01b OR 10b OF Tip PACKET TO SUBSTITUTE.
	VOBU_3RDREF_EA	COUNT PACKS UNTIL THE LAST PACK OF THIRD PES PACKET AFTER TS2PS CONVERSION OF WHICH picture_coding_type IS 01b OR 10b OF Tip PACKET TO SUBSTITUTE.
	VOBU_C_IDN	ASSIGN THE NUMBER OF CELL TO WHICH THE CORRESPONDING NV_PCK IS BELONG (DESIGNATED BY RECORDER/USER)
	C_ELTM	SAME TO PCI data
	VOB_V_S_PTM	ASSIGN VOBU_S_PTM OF THE FIRST VOBU.
	VOB_V_E_PTM	ASSIGN REPRODUCTION END TIME OF CONVERSION SECTION (IT MAY BE OBTAINED BEFORE TS2PS CONVERSION)
	VOBU_SRI	INFORMATION IS EXTRACTED WITH A SET OF NV_PCK_LBN AND VOBU_S_PTM ON TS2PS CONVERSION AND THEN ASSIGNED IT TO THIS FIELD. ALTERNATELY, A VALUE CALCULATED FROM ACCESS MAP.
	A_SYNCA	COMPARING VOBU_S_PTM OF NV_PCK WITH AUDIO PTS, THE NUMBER OF PACKS COUNTED TO ONE PACK BEFORE THE PACK AUDIO PTS IS GREATER THAN VOBU_S_PTM AT THE FIRST TIME IS ASSIGNED TO THIS FIELD.

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Fig.83A

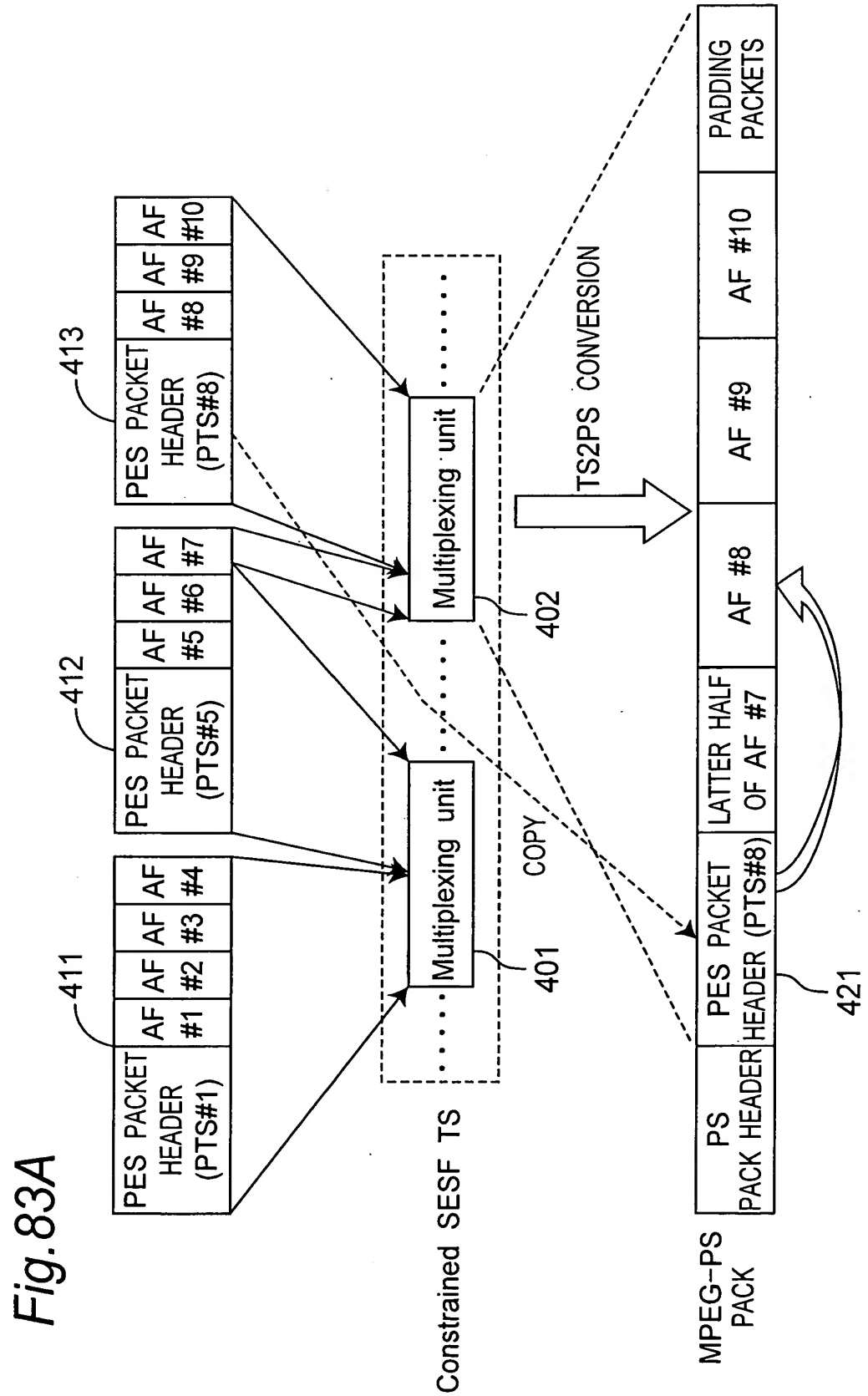
411
PES PACKET HEADER (PTS#1)
AF #1
AF #2
AF #3
AF #4
412
PES PACKET HEADER (PTS#5)
AF #5
AF #6
AF #7
413
PES PACKET HEADER (PTS#8)
AF #8
AF #9
AF #10
Multiplexing unit
401
Multiplexing unit
402
Constrained SESF TS
COPY
TS2PS CONVERSION
PS PACK HEADER
PES PACKET HEADER (PTS#8)
LATTER HALF OF AF #7
AF #8
AF #9
AF #10
PADDING PACKETS
421
MPEG-PS PACK

Fig.83B

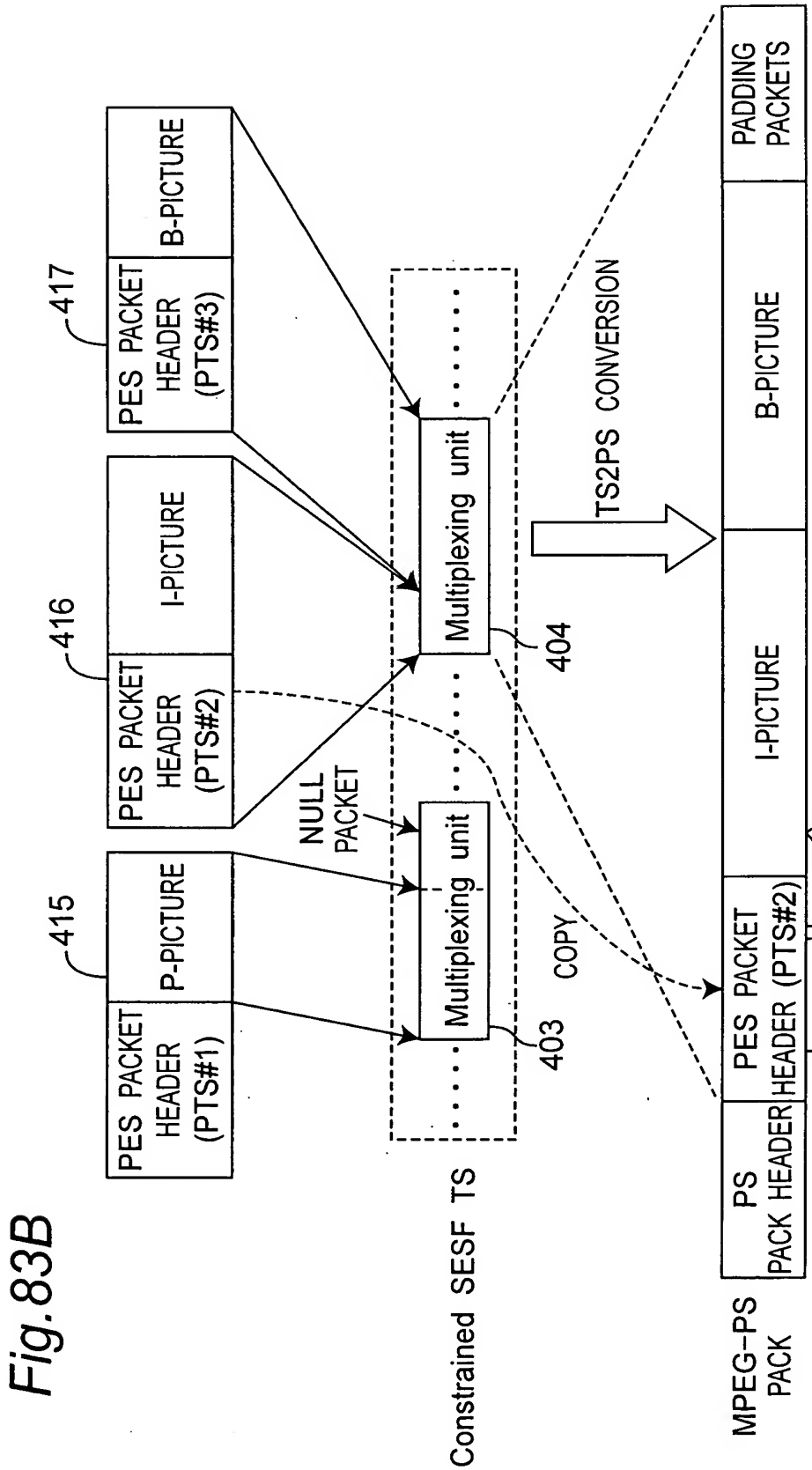
415
PES PACKET HEADER (PTS#1)
P-PICTURE
416
PES PACKET HEADER (PTS#2)
I-PICTURE
417
PES PACKET HEADER (PTS#3)
B-PICTURE
NULL PACKET
Multiplexing unit
403
Multiplexing unit
404
Constrained SESF TS
COPY
TS2PS CONVERSION
PS PACK HEADER
PES PACKET HEADER (PTS#2)
I-PICTURE
B-PICTURE
PADDING PACKETS
421
POINTED OUT BY PTS
MPEG-PS PACK

Fig.84A

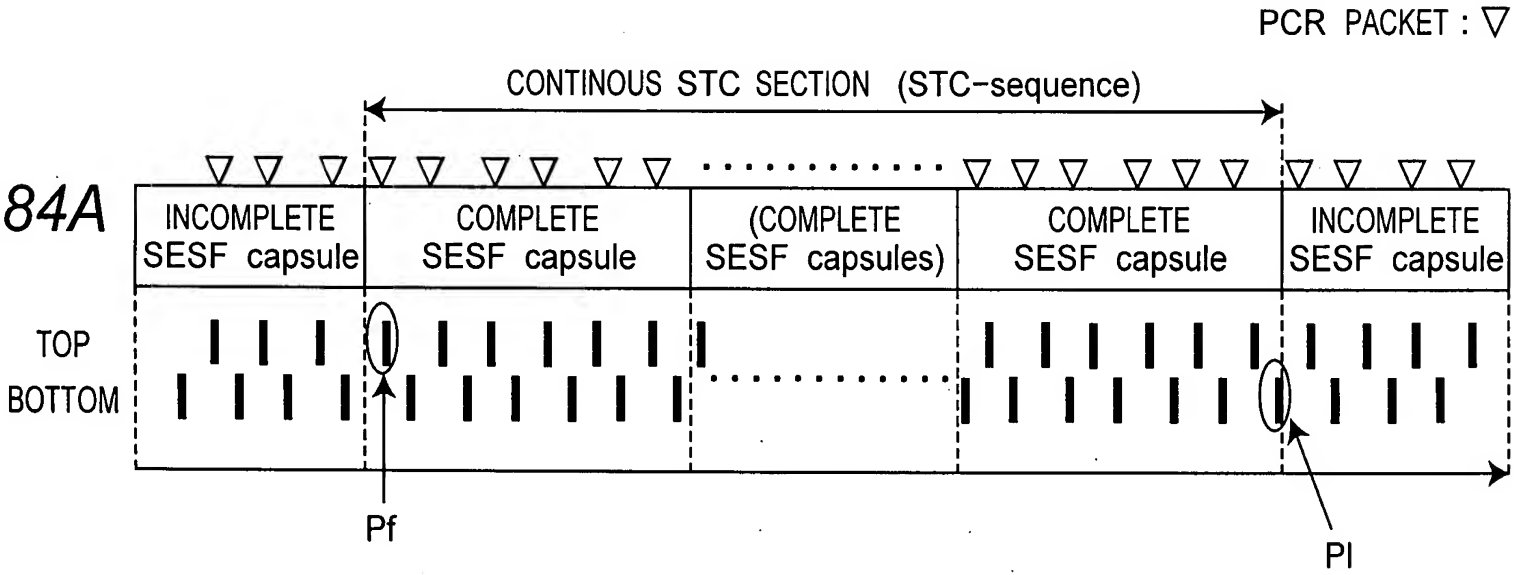

Fig.84B

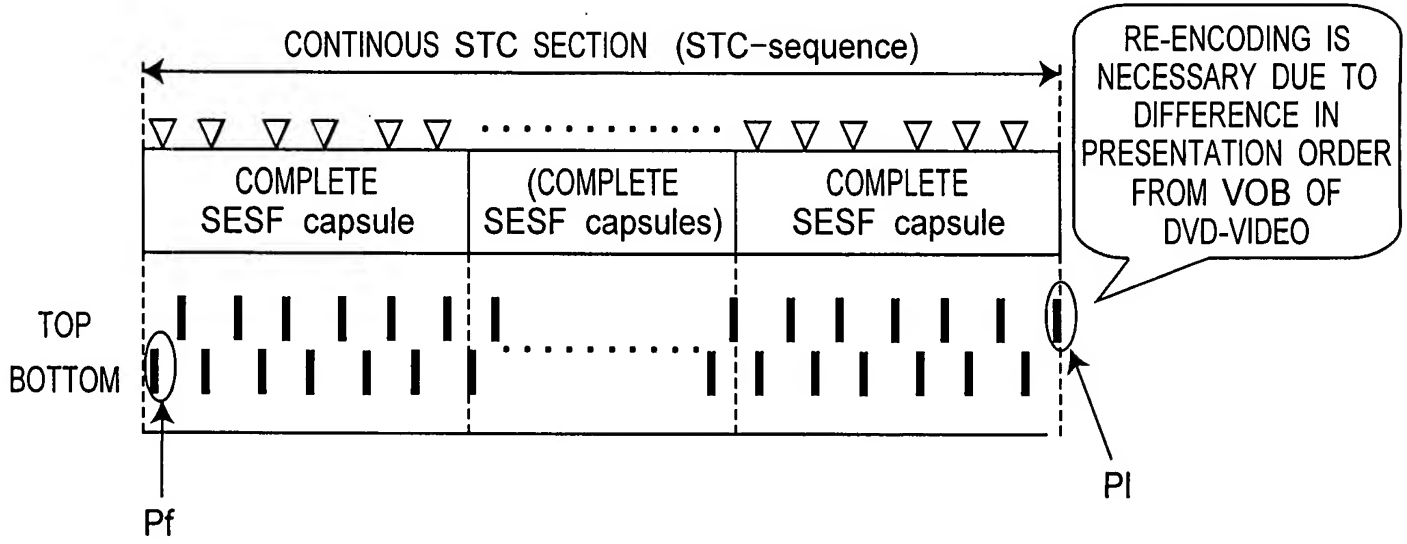

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Fig.85

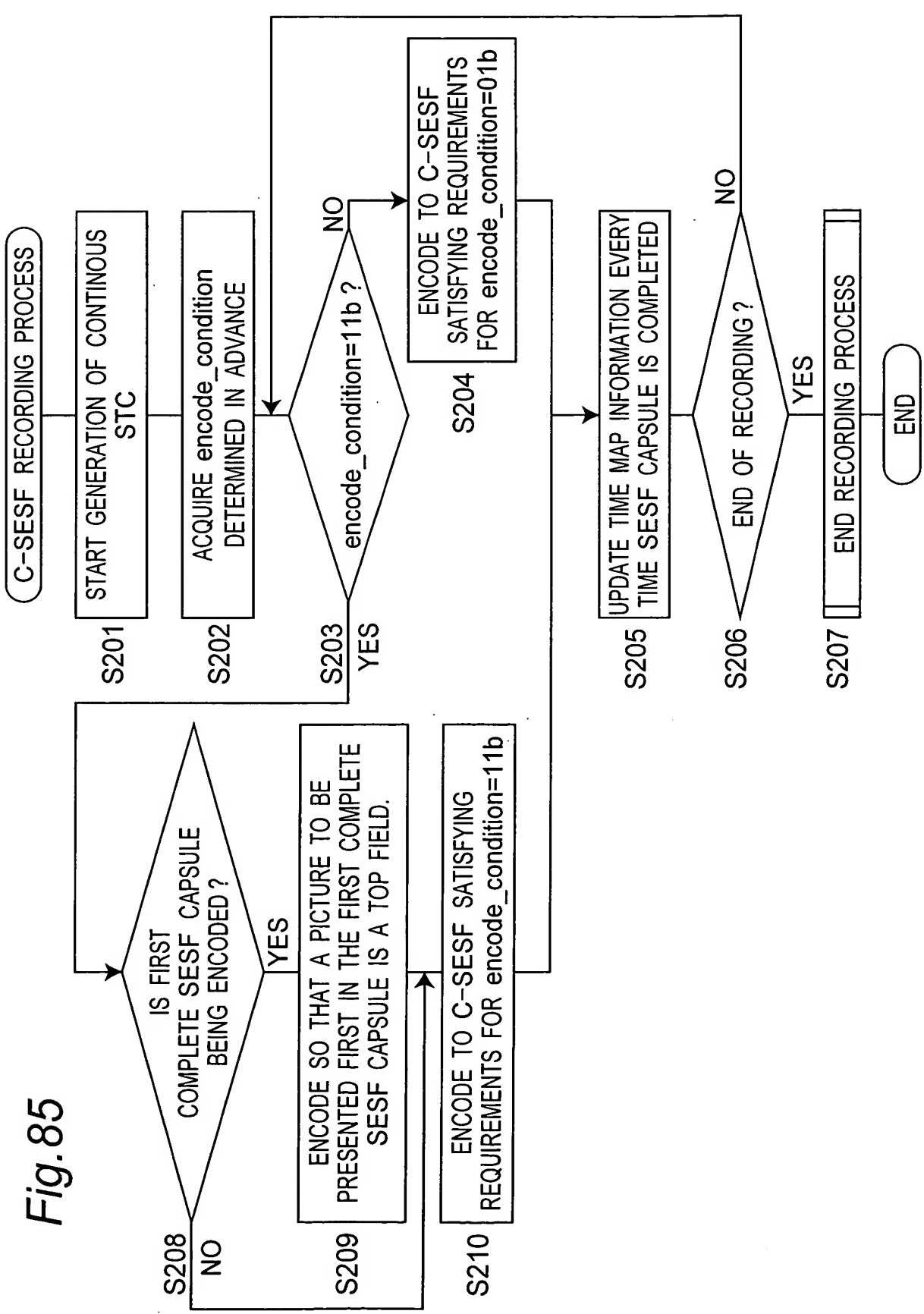
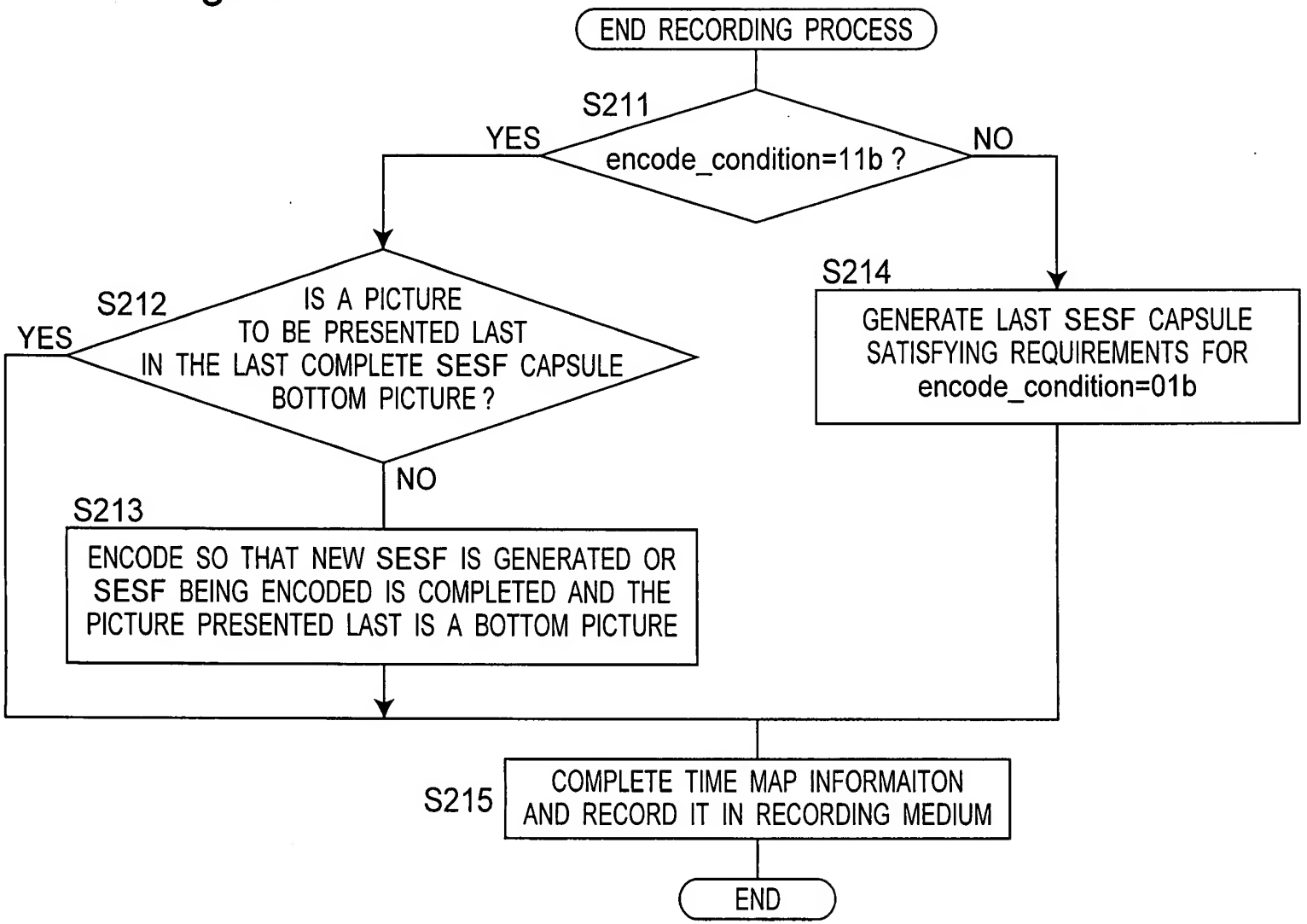

C-SESF RECORDING PROCESS
START GENERATION OF CONTINOUS STC
S201
ACQUIRE encode_condition DETERMINED IN ADVANCE
S202
encode_condition=11b ?
S203
NO
YES
ENCODE TO C-SESF SATISFYING REQUIREMENTS FOR encode_condition=01b
S204
UPDATE TIME MAP INFORMATION EVERY TIME SESF CAPSULE IS COMPLETED
S205
END OF RECORDING ?
S206
NO
YES
END RECORDING PROCESS
S207
END
IS FIRST COMPLETE SESF CAPSULE BEING ENCODED ?
S208
NO
YES
ENCODE SO THAT A PICTURE TO BE PRESENTED FIRST IN THE FIRST COMPLETE SESF CAPSULE IS A TOP FIELD.
S209
ENCODE TO C-SESF SATISFYING REQUIREMENTS FOR encode_condition=11b
S210

Fig.86



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